

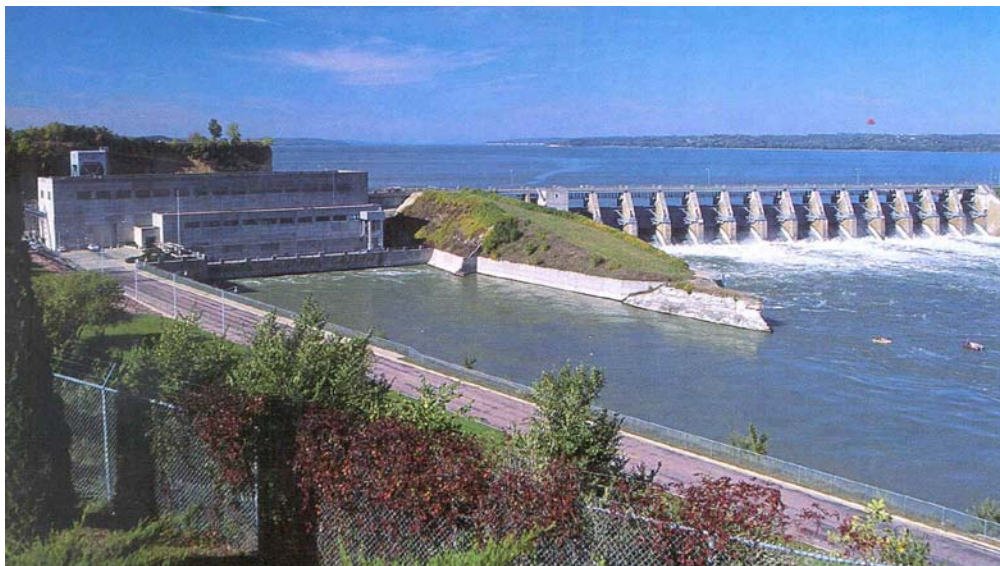


**U.S. Army Corps  
of Engineers**  
Omaha District

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# **Gavins Point Dam/Lewis and Clark Lake Master Plan**

**Missouri River, Nebraska and South Dakota**



**Update of Design Memorandum MG-123**

**December 2004**

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**Gavins Point Dam/Lewis and Clark Lake Master Plan  
Missouri River, Nebraska and South Dakota**

**Update of Design Memorandum MG-123**

**December 2004**

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## **PERTINENT DATA**

### **GENERAL**

|  |  |
|--|--|
| Location of Dam                          | The dam is located 4 miles upstream from and west of Yankton, South Dakota, on the Missouri River 811.1 miles from its mouth.                                |
| Primary<br>Operating and Managing Agency | U.S. Army Corps of Engineers   |
| Purposes                                 | Flood control, hydroelectric power, navigation, irrigation, fish and wildlife enhancement, public water supply, improvement of water quality, and recreation |
| Authorization                            | Flood Control Act of 22 December 1944, as amended (Public Law 78-534)  |
| Year Construction Started                | 1952   |
| Year Dam Placed in<br>Operation          | 31 July 1955   |
| Project Cost                             | \$50 million   |

### **DAM AND EMBANKMENT**

|   |                                  |
|---|----------------------------------|
| Type  | Rolled earth and chalk fill      |
| Fill Quantity                               | 7,000,000 cubic yards            |
| Concrete (all structures)                   | 308,000 cubic yards              |
| Foundation Material                         | Niobrara Chalk and Carlile Shale |
| Height                                      | 74 feet                          |
| Length of Top<br>(Elevation 1234 ft m.s.l.) | 8,700 feet (includes spillway)   |
| Width at Base (Max.)<br>and w/o berms       | 850 feet<br>450 feet             |

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### **POWER PLANT**

|                                     |   |
|-------------------------------------|---|
| Average Gross Head Available        | 48 feet                                   |
| Number and Size of Conduits         | None, direct intake                       |
| Number and Size of Surge Tanks      | None                                      |
| Number, Type, and Speed of Turbines | 3 – Kaplan, 75 RPM                        |
| Discharge Capacity at Rated Head    | Full gate 48 feet net head, 36,000 c.f.s. |
| Generator Rating of Units           | 3 @ 44,100 kW                             |
| Total Plant Capacity                | 132,300 kW                                |
| Dependable Capacity                 | 74,000 kW                                 |
| Average Annual Energy Production    | 754 million kWh                           |

### **SPILLWAY**

|  |   |
|--|---|
| Location   | Right bank, adjacent to powerhouse            |
| Type   | Concrete-lined chute with gated overflow weir |
| Crest Elevation  | 1,180 feet m.s.l.                             |
| Width (including piers)  | 664 feet (gated)                              |
| Number, Size, and Type Gates                                       | 14, 40 X 30 feet, Tainter                     |
| Design Discharge Capacity at<br>Elevation 1,221.4 feet m.s.l.      | 584,000 c.f.s.                                |
| Discharge Capacity at Maximum<br>Operating Pool (1,210 ft. m.s.l.) | 345,000 c.f.s.                                |

### **RESERVOIR**

|   |                                     |
|---|-------------------------------------|
| Drainage Area Upstream from<br>Gavins Point Dam | 279,480 square miles                |
| Lewis and Clark Lake<br>Drainage Area           | 16,000 square miles                 |
| Length (Elev. 1,210)                            | 25 miles (ending near Niobrara, NE) |

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|   |   |
|---|---|
| Shoreline (Elev. 1,204.5)                                     | 90 miles  |
| Average Daily Water Inflow                                    | 29,000 c.f.s. (total)      2,000 c.f.s. (incremental)   |
| Average Annual Sediment Inflow                                | 2,625 acre-feet   |
| Storage Capacity  | 491,700 acre-feet (@ 1,210 feet m.s.l., maximum operating pool)<br>432,000 acre-feet (@ 1,208 feet m.s.l., multiuse pool) |
| Maximum Depth   | 50 feet   |
| Maximum Operating Pool<br>Elevation and Area                  | 1,210 feet m.s.l. 31,400 acres  |
| Normal Operating Pool<br>Elevation and Area                   | 1,208 feet m.s.l. 28,000 acres  |
| Minimum Flood Control<br>Pool Elevation and Area              | 1,204.5 feet m.s.l. 24,000 acres  |
| Exclusive Flood Control<br>Pool Elevation and<br>Storage Area | 1,210-1,208 feet m.s.l.<br>59,000 acre-feet   |

NOTE: Reservoir operations may be subject to changes identified in the Missouri River Master Water Control Manual, which is currently being updated.



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**CORPS OF ENGINEERS REPORTS**  
**GAVINS POINT DAM / LEWIS AND CLARK LAKE**  
**BIBLIOGRAPHY OF REFERENCE DATA**

| <b>NUMBER</b> | <b>TITLE</b>   | <b>DATE SUBMITTED</b> | <b>DATE APPROVED</b> |
|---------------|--|-----------------------|----------------------|
| MG-1          | Preliminary Studies<br>Relating to Gavins Point<br>Reservoir Project | MAR 49                |                      |
| MG-2          | DPR, Gavins Point<br>Reservoir                                       | NOV 49                | MAR 51               |
| MG-3          | Appendix I, Meteorology,<br>Hydrology and General<br>Hydraulics      | SEP 49                | MAR 51               |
| MG-4          | Appendix II, Sediment  | DEC 49                | MAR 51               |
| MG-5          | Appendix III, Geology  | DEC 49                | MAR 51               |
| MG-6          | Appendix IV, Earthwork<br>Design                                     | DEC 49                | MAR 51               |
| MG-7          | Appendix V, Hydraulic<br>Design                                      | DEC 49                | MAR 51               |
| MG-8          | Appendix VI, Structures  | DEC 49                | MAR 51               |
| MG-9          | Appendix VII,<br>Hydroelectric Power                                 | DEC 49                | MAR 51               |
| MG-10         | Appendix VIII,<br>Construction Material                              | DEC 49                | MAR 51               |
| MG-11         | Appendix IX, Construction<br>Facilities                              | DEC 49                | MAR 51               |
| MG-12         | Appendix X, Construction<br>Time and Schedule                        | DEC 49                | MAR 51               |
| MG-13         | Appendix XI, Relocations   | DEC 49                | MAR 51               |
| MG-14         | Appendix XII, Real Estate  | DEC 49<br>REV JAN 53  | MAR 51               |
| MG-15         | Appendix XIII, Cost<br>Estimates                                     | DEC 49                | MAR 51               |
| MG-16         | Appendix XIV, Malaria<br>Control                                     | DEC 49                | MAR 51               |

| NUMBER | TITLE  | DATE SUBMITTED | DATE APPROVED |
|--------|--|----------------|---------------|
| MG-17  | Appendix XV, Recreation and Wildlife Development   | DEC 49         | MAR 51        |
| MG-18  | Omaha Dist Ltr to OCE<br>Subj: "Transmittal of DPR, Gavins Point Reservoir Project" with 3 Inds.                     | FEB 50         | MAR 51        |
| MG-19  | Supplemental Report on Spillway  | DEC 50         | MAR 51        |
| MG-20  | Appendix XIII-A, Cost Estimates  | DEC 50         | MAR 51        |
| MG-21  | AD, South Access Road, Gavins Point Dam  | NOV 51         | NOV 51        |
| MG-22  | Omaha Dist Ltr to OCE<br>Subj: "Transmittal of Second Report on Spillway, Gavins Point Reservoir" with 3 Inds        | NOV 51         | DEC 51        |
| MG-23  | Second Supplemental Report on Spillway   | NOV 51         | DEC 51        |
| MG-24  | Omaha Dist Ltr to OCE thru MRD, subj: "Embankment Section - Gavins Point Dam" and Endorsements thereto               | JAN 52         | JAN 52        |
| MG-25  | AD, Powerhouse Turbines, Gavins Point Reservoir  | JAN 52         | FEB 52        |
| MG-26  | Appendix I, AD, Powerhouse Turbines Gavins Point Reservoir   | JAN 52         | FEB 52        |
| MG-27  | Omaha District Ltr subj: "Transmittal of Third Supplement to Gavins Point DPR, Gavins Point Reservoir," with 7 Inds. | FEB 52         | APR 52        |
| MG-28  | Appendix III, Revised – Geology  | MAR 52         | JUL 52        |

| NUMBER | TITLE  | DATE SUBMITTED | DATE APPROVED |
|--------|--|----------------|---------------|
| MG-29  | Appendix IV, Revised – Earthwork   | MAR 52         | MAR 52        |
| MG-30  | AD, Generators - Gavins Point Reservoir  | MAR 52         | MAR 52        |
| MG-31  | AD, Earthwork Stage I, Gavins Point Reservoir  | MAR 52         | MAR 52        |
| MG-32  | Third Supplemental Report on Spillway  | REV MAY 52     | AUG 52        |
| MG-33  | Omaha Dist Ltr to MRD, Subj: "Approval to Construct Temporary Administration & Service Facilities- Gavins Point" and 3 Inds. | JUL 52         | JUL 52        |
| MG-34  | Earthwork  | NOV 52         | DEC 52        |
| MG-35  | Construction Materials   | DEC 52         | JAN 53        |
| MG-36  | Spillway   | DEC 52         | JAN 53        |
| MG-37  | Seeding and Planting, Access Road & Administration Area  | JAN 53         | FEB 53        |
| MG-38  | Preliminary Design Report, Powerhouse and Switchyards  | NOV 52         | JUN 53        |
| MR-48  | Ft. Randall and Gavins Point, Stop Logs, Lifting Beams, and Bulkheads  | FEB 54         | MAR 54        |
| MR-51  | Ft. Randall and Gavins Point Monorail Equipment for Spillways  | SEP 53         | OCT 53        |
| MG-39  | DM, Protective Floating Boom   | JAN 54         | JAN 54        |
| MG-40  | DM, Surfacing Visitors' Parking Area, Administration Area  | FEB 54         | APR 54        |

| NUMBER | TITLE  | DATE SUBMITTED       | DATE APPROVED |
|--------|--|----------------------|---------------|
| MG-41  | DM, Spillway - Supplement to Design Memorandum MG-36   | MAR 54               | MAY 54        |
| MG-42  | DM, Permanent Housing  | APR 54               | JUN 54        |
| MG-43  | DM, City of Springfield, S.D. Sanitary Facilities for Protection of Public Health & Safety OCE requested it be revised in accordance with plan approved in DPR | MAY 54<br>REV MAY 54 |               |
| MG-44  | DM, Reservoir Clearing   | JUL 54               | OCT 54        |
| MG-45  | DM, Foundation Grouting  | OCT 54               | NOV 54        |
| MG-46  | DM, Radio Facilities   | NOV 54               | JAN 55        |
| MG-47  | DM, Pressure Relief Wells  | DEC 54               | JAN 55        |
| MG-48  | DM, Analysis of Design, Powerhouse Switchyard, Power Plant   | NOV 54               | MAR 54        |
| MG-49  | DM, Boat Basins  | REV JUN 55           | AUG 55        |
| MG-50  | DM, Relocation of County Highway-Knox County, NE   | MAY 55               | AUG 55        |
| MG-51  | DM, Relocation of County Highway-Bon Homme County  | JUN 55               | AUG 55        |
| MG-52  | DM, Embankment Seeding   | JUL 55               | AUG 55        |
| MG-53  | DM, Seeding and Planting   | AUG 55               | OCT 55        |
| MG-54  | DM, REM, Segment G and Additional Lands in Segment F   | AUG 55               |               |
| MG-55  | DM, Crest Roadway, Embankment Service Roads, Powerhouse Roads and Parking Areas  | NOV 55               | MAR 56        |
| MG-56  | DM, Recreational Development   | DEC 55               | MAR 56        |

| NUMBER | TITLE  | DATE SUBMITTED | DATE APPROVED |
|--------|--|----------------|---------------|
| MR-81  | DM, Hydrology Reporting Network (Retd. for Revision)   | MAY 56         |               |
| MG-58  | DM, Ltr Rpt, Seepage & Erosion Control, Embankment Toe Area  | AUG 56         | OCT 56        |
| MG-59  | DM, Maintenance Buildings, Yard, Fencing, and Flagpole   | JAN 57         | JAN 57        |
| MG-60  | DM, Ltr Rpt, Seeding and Planting Powerhouse Area  | OCT 56         | DEC 56        |
| MG-61  | DM, Ltr Rpt, Subj: "Design Memorandum MG-61 - Spillway Tainter Gate Hoist Chain Strippers, Gavins Point Reservoir"       | MAY 57         | JUN 57        |
| MG-62  | DM, Miscellaneous Completion Work  | JUL 57         | SEP 57        |
| MG-63  | DM, Blacktop, Crest Road and Embankment Road   | DEC 57         | FEB 58        |
| MG-64  | DM, Ltr Rpt, Subj: Design Memorandum MG-64 - Repair of Upstream Cavity Wall in Generator Room, Powerhouse (Retd. by MRD) | JAN 58         |               |
| MG-65  | DM, Repair Chalk Island  | REV AUG 58     | NOV 58        |
| MG-66  | DM, Ltr Rpt, Subj: "Gavins Point Res, NE & SD; Des Memo No. MG-66, Public Warning System"                                | JUL 58         | NOV 58        |
| MG-67  | DM, Ltr Rpt, Subj: "Gavins Point Res, Des Memo MG-67, Sup. No. 2 to DM MG-56 - Recreational Area Development"            | OCT 58         | DEC 58        |
| MG-68  | DM, Permanent Exhibits, Gavins Point Powerhouse  | OCT 58         | DEC 58        |

| NUMBER | TITLE   | DATE SUBMITTED       | DATE APPROVED |
|--------|---|----------------------|---------------|
| MG-69  | DM, Boat Basin and Shoreline Protection   | DEC 58<br>REV APR 59 | JUN 59        |
| MG-70  | DM, Ltr Rpt, Subj: "Gavins Point Dam and Reservoir S.D., DM MG-70, Yankton Water Supply, Yankton, SD"   | FEB 59               | MAY 59        |
| MG-71  | DM, Extension of Switchyard Slope Protection  | APR 59               | MAY 59        |
| MG-72  | DM, Hydrologic Reporting Network  | SEP 59               |               |
| MG-73  | DM, Ltr Rpt, Subj: Additional Recreation Facilities Proposed for FY61   | AUG 60               |               |
| MG-74  | DM, Ltr Rpt, Subj: "Gavins Point Reservoir, NE & SD; Des Memo No. MG-74 Santee & Miller Cr Rec Area Dev"  | JAN 60               | FEB 60        |
| MG-75  | DM, Powerhouse Intake Service Gates; Cathodic Protection  | JUL 60               | AUG 60        |
| MG-76  | DM, Ltr Rpt, Subj: "Gavins Point Res, NE & SD; Des Memo No. MG-76 - Right Abutment, Chalk Slope Treatment" Retd by MRD 12/14/60. No further action      | OCT 60               |               |
| MG-77  | DM, Ltr Rpt, Subj: "Gavins Point Reservoir, NE & SD; Des Memo No. MG-77 - Additional Rec Facts Proposed for FY62. Rtd by MRD- Approved by MG-67 & MG-73 | MAR 61               |               |
| MG-78  | DM, Tailrace Slope Protection.  | JUL 61               | SEP 69        |

| NUMBER | TITLE  | DATE SUBMITTED | DATE APPROVED |
|--------|--|----------------|---------------|
| MG-79  | DM, Ltr Rpt, Subject:<br>"Gavins Point Reservoir,<br>SD; Des Memo No. MG -79<br>-Switchyard Maintenance<br>Roadway"        | SEP 61         |               |
| MG-80  | Ltr DM, Boat Barriers for<br>Spillway Gates  | JUL 63         |               |
| MG-81  | DM, Rehabilitation of<br>Boating Facilities  | AUG 63         | MAY 64        |
| MG-82  | Ltr DM, Recreational Fac<br>for Weigand Area,<br>Pearson's Ranch, Overlook,<br>Training Dike, and<br>Tailwater Units; FY64 | JUL 63         | OCT 63        |
| MG-83C | DM, Updated Master Plan  | DEC 64         | JAN 65        |
| MG-83C | DM, Updated Master Plan,<br>Appendix B, Natural<br>Resources Management<br>Plan  | DEC 77         | JUN 78        |
| MG-83C | DM, Updated Master Plan,<br>Appendix F, Lakeshore<br>Management Plan   | DEC 76         | MAY 77        |
| MG-84  | DM, Relocation of<br>Maintenance Facilities  | DEC 64         |               |
| MG-85  | DM, Upstream Berm Test<br>Section  | JAN 67         |               |
| MG-86  | DM, Exhibit<br>Recommendation, New<br>Vestib. GP Powerhouse  | FEB 57         |               |
| MG-87  | DM, Additional Bank Prot.  | FEB 68         |               |
| MG-88  | DM, North Shore Pollution<br>Abatement System  | SEP 68         |               |
| MG-89  | DM, Upstream Berm Slope<br>Protection  |                |               |
| MG-90  | DM, Service Roads, Maint<br>Yd - Rehabilitation and<br>Bank Stabilization  | NOV 69         |               |



| NUMBER | TITLE  | DATE SUBMITTED                     | DATE APPROVED |
|--------|--|------------------------------------|---------------|
| MG-91  | DM, Relocation of Niobrara, Nebr & Acq of Niobrara State Park            | JUN 70                             |               |
| MG-92  | DM, Chalk Island Protection  | JUL 70                             | JAN 71        |
| MG-93  | Ltr DM, Spillway Chute Slab Rehabilitation                               | JUL 70                             | OCT 70        |
| MG-94  | DM, Crest Road Rehabilitation  | DEC 70                             | AUG 71        |
| MG-95  | DM, Proposed Bank Protection, Training Dike Extension and Boat Ramp      | MAR 71<br>RET MAY 71<br>REV APR 72 | MAY 72        |
| MG-96  | DM, Bank Stabilization in Vicinity of Bon Homme Hutterian Brethren, Inc. | E NOV 71<br>T JAN 72<br>REV MAY 72 | AUG 72        |
| MG-97  | DM, Visitor Center   | APR 72                             | SEP 72        |
| MG-98  | DM, Relief Well Discharge Pipe Extension                                 | AUG 72                             | AUG 72        |
| MG-99  | DM, Downstream Chalk Island Protection                                   | JUL 72                             | SEP 72        |
| MG-100 | DM, Water & Sewer Rehabilitation   | DEC 72                             | MAR 73        |
| MG-101 | DM, Power Distribution System, Vicinity of Powerhouse                    | MAY 73<br>RET JUN 73<br>REV SEP 73 | OCT 73        |
| MG-102 | DM, Water & Sewage Systems for Visitors Center & Tailwaters Areas        | AUG 73                             | JUN 74        |
| MG-103 | DM, Support Facilities, Visitor Center                                   | AUG 73<br>RET SEP 73<br>REV DEC 73 | FEB 74        |

| NUMBER | TITLE  | DATE SUBMITTED   | DATE APPROVED |
|--------|--|--|---------------|
| MG-104 | DM, North Shore<br>Recreation Areas Bomb<br>Protection                                 | MAR 74   | MAY 74        |
| MG-105 | DM, Belden Line Metering   | MAY 75   | JUN 75        |
| MG-106 | DM, Spillway Tainter Gate<br>Hoist Rehabilitation                                      | RET FEB 76<br>REV MAR 76   | MAR 76        |
| MG-107 | DM, Intake Gate Hoists<br><br>Revision No. 2   | JUN 76<br><br>RET AUG 76<br>REV APR 77<br>RET JUN 77<br>MAY 78<br>RET AUG 78<br>SEP 79 | NOV 79        |
| MG-108 | DM, Steep Slope<br>Protection, Visitors Center   | NOV 76<br>RET DEC 76   |               |
| MG-109 | DM, Generator Thrust<br>Bearing High Pressure Lift<br>Systems for Units 1, 2, and<br>3 | FEB 77   | MAY 77        |
| MG-110 | DM, Upgrade Power<br>Source, North Bank<br>Recreation Area                             | MAR 77   | MAY 77        |
| MG-111 | DM, Slope Protection<br>Downstream of at Right<br>Tailrace Wall (Revised)              | DEC 77<br>RET JUN 78<br>MAR 79   | APR 79        |
| MG-112 | DM, Fish Cleaning Facility,<br>Tailwater Area (Revised)                                | MAR 78<br>MAR 78<br>RET APR 78   |               |
| MG-113 | DM, Weigand West<br>Camping Area Shore<br>Protection                                   | MAY 78   | JUN 78        |

| NUMBER | TITLE   | DATE SUBMITTED                     | DATE APPROVED |
|--------|---|------------------------------------|---------------|
| MG-114 | DM, Replace Current Transformers on Station Service Bus, Powerplants                    | MAY 79                             | MAY 79        |
| MG-115 | DM, Replace Restroom, Overlook "B"  | SEP 79<br>RET OCT 79<br>REV MAR 80 | APR 80        |
| MG-116 | DM, Entrance Gate, Visitor Center   | DEC 79                             | FEB 80        |
| MG-117 | DM, Fishing Pier for the Handicapped, Right Bank Downstream Area                        | FEB 80                             | MAR 80        |
| MG-118 | DM, Maintenance Facility Heating System and Exterior Lighting Upgrade                   | APR 81<br>RET AUG 81               |               |
| MG-119 | DM, Connect Downstream Sewer Facilities Training Dike Area                              | APR 82<br>RET JUN 82               |               |
| MG-120 | DM, Proposed Automatic Monitoring System for the Strong Motion Instrumentation          | MAY 84                             | JUN 84        |
| MG-121 | DM, Vehicle Storage Facility  | JAN 85                             | FEB 85        |
| MG-122 | DM, Forebay Bank Protection   | JAN 85                             |               |
| MN-1   | DM, Acquisition of the Town of Niobrara and Niobrara State Park                         | OCT 72                             | FEB 73        |
| MN-2   | Ltr. DM, Electric Power Loop around Village (of Niobrara) and Electric Service to Wells | AUG 74                             | AUG 74        |
| MN-3   | Ltr. DM, Utilities Relocations, Telephone and Power, Niobrara, Nebraska                 | SEP 74                             | OCT 74        |

| NUMBER | TITLE   | DATE SUBMITTED | DATE APPROVED |
|--------|---|----------------|---------------|
| MN-4   | DM, Master Plan,<br>Relocation of Niobrara,<br>Nebraska Townsite and<br>Acquisition of Niobrara<br>State Park                 | JAN 78         |               |
| --     | Feasibility Report on the<br>Ground Water Problem at<br>Niobrara, Nebraska and<br>Niobrara State Park                         | FEB 72         | AUG 72        |
| --     | Ltr. Supp. No. 1 to<br>Feasibility Report the<br>Ground Water Problem at<br>Niobrara, Nebraska and<br>Niobrara State Park     | FEB 75         | APR 75        |
| MG-123 | Design Memorandum –<br>Master Plan, Missouri<br>River, Nebraska and South<br>Dakota; Gavins Point<br>Dam/Lewis and Clark Lake |                | JUL 88        |
| MG-124 | DM, Kohles Acres<br>Shoreline Protection  |                | JUN 88        |
| MG-125 | DM, Upgrade the Existing<br>Sewage Lagoons Right<br>Bank, Lewis and Clark<br>Lake Project                                     |                | AUG 89        |
| MG-126 | DM, Administration<br>Building  |                | FEB 91        |

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## ACRONYMS AND ABBREVIATIONS

|          |   |
|----------|---|
| AC-FT    | Acre-feet   |
| AC-FT/YR | Acre-feet per year                                    |
| BIA      | Bureau of Indian Affairs                              |
| BLM      | Bureau of Land Management                             |
| BOR      | Bureau of Reclamation                                 |
| CFR      | Code of Federal Regulations                           |
| C.F.S.   | Cubic feet per second                                 |
| COE      | Corps of Engineers                                    |
| CRMP     | Cultural Resource Management Plan                     |
| DM       | Design Memorandum                                     |
| EA       | Environmental Assessment                              |
| EIS      | Environmental Impact Statement                        |
| EM       | Engineer Manual                                       |
| EPA      | Environmental Protection Agency                       |
| ER       | Engineer Regulation                                   |
| F        | Fahrenheit  |
| FY       | Fiscal Year   |
| GSA      | General Services Administration                       |
| HPMP     | Historic Properties Management Plan                   |
| HQUSACE  | Headquarters, U.S. Army Corps of Engineers            |
| KAF      | Thousand Acre Feet                                    |
| LWCF     | Land and Water Conservation Fund                      |
| MAF      | Million Acre Feet                                     |
| MOA      | Memorandum of Agreement                               |
| MOU      | Memorandum of Understanding                           |
| MNRR     | Missouri National Recreational River                  |
| MPH      | Miles Per Hour  |
| MRD      | Missouri River Division, U.S. Army Corps of Engineers |
| MSA      | Metropolitan Statistical Area                         |
| M.S.L.   | Mean Sea Level  |
| MU       | Management Unit                                       |
| NAWMP    | North American Waterfowl Management Plan              |
| NDEC     | Nebraska Department of Environmental Control          |
| NDEQ     | Nebraska Department of Environmental Quality          |
| NGPC     | Nebraska Game and Parks Commission                    |
| NGVD     | National Geodetic Vertical Datum of 1929              |
| NEPA     | National Environmental Policy Act                     |
| NPS      | National Park Service                                 |
| NRCS     | Natural Resources Conservation Service                |
| NRHP     | National Register of Historic Places                  |

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|         |  |
|---------|--|
| NRMS    | Natural Resource Management System               |
| OD      | Omaha District                                   |
| OMP     | Operational Management Plan                      |
| ORV     | Offroad Vehicle                                  |
| PAR     | Post-Authorization Mitigation Report             |
| PPCS    | Power Plant Control System                       |
| PPJV    | Prairie Pothole Joint Venture                    |
| RA      | Recreation Area                                  |
| REHAC   | Regional Hydropower Action Center                |
| RM      | River Mile                                       |
| RV      | Recreational Vehicle                             |
| SCORP   | Statewide Comprehensive Outdoor Recreation Plan  |
| SCS     | Soil Conservation Service                        |
| SHPO    | State Historic Preservation Officer              |
| SDGFP   | South Dakota Department of Game, Fish, and Parks |
| SRA     | State Recreation Area                            |
| SQ. MI. | Square Mile(s)                                   |
| SRUF    | Special Recreation User Fees                     |
| SRST    | Standing Rock Sioux Tribe                        |
| U.S.C.  | United States Code                               |
| USEPA   | United States Environmental Protection Agency    |
| USFWS   | United States Fish and Wildlife Service          |
| USGS    | United States Geological Survey                  |
| WAPA    | Western Area Power Administration                |
| WES     | Waterways Experiment Station                     |
| WMA     | Wildlife Management Area                         |

## **1. INTRODUCTION**

The Gavins Point Dam/Lewis and Clark Lake project was authorized for flood control, navigation, hydropower, fish and wildlife, recreation, irrigation, municipal and industrial water supply, and other purposes. This updated Master Plan guides the use and development of the natural and manmade resources of the project. It affirms land use classifications and management practices similar to those already in effect. It also provides for recreational opportunities while maintaining the integrity of natural resources. The Master Plan provides guidance on public use, water quality, natural areas, and historic properties within Corps of Engineers' (Corps) boundaries.

The Corps is a primary steward of the lands and waters at its water resources projects. Its Natural Resources Management mission is to manage, conserve, and enhance these natural resources and the environment while providing quality public outdoor recreation experiences to serve the needs of present and future generations. In all aspects of natural and cultural resource management, Corps managers promote awareness of environmental values and adhere to sound environmental stewardship, protection, compliance, and restoration practices.

The Master Plan provides for stewardship of natural resources and manages for long-term public access to, and use of, the natural resources. The planning process was conducted in cooperation with other Federal, State, tribal, and local governmental agencies, as well as the private sector. The land classifications and management guidelines contained in this Master Plan reflect the potentials of the natural resources of the area and the identified population and visitation patterns.

### **1.1. PROJECT DESCRIPTION**

The Gavins Point Dam/Lewis and Clark Lake project was originally conceived as part of a comprehensive river basin development program in the Missouri River drainage basin (Figure 1-1) known as the Pick-Sloan Plan. Gavins Point Dam (Figure 1-2), completed in 1955, is the most downstream dam in a series of six main stem Missouri River impoundments. This system of dams extends from Fort Peck Dam near Glasgow, Montana to Gavins Point Dam, located four miles west of Yankton, South Dakota.



Figure 1-1. Omaha District Civil Works Boundary Emphasizing the Missouri River Main Stem System of Six Dams and Reservoirs

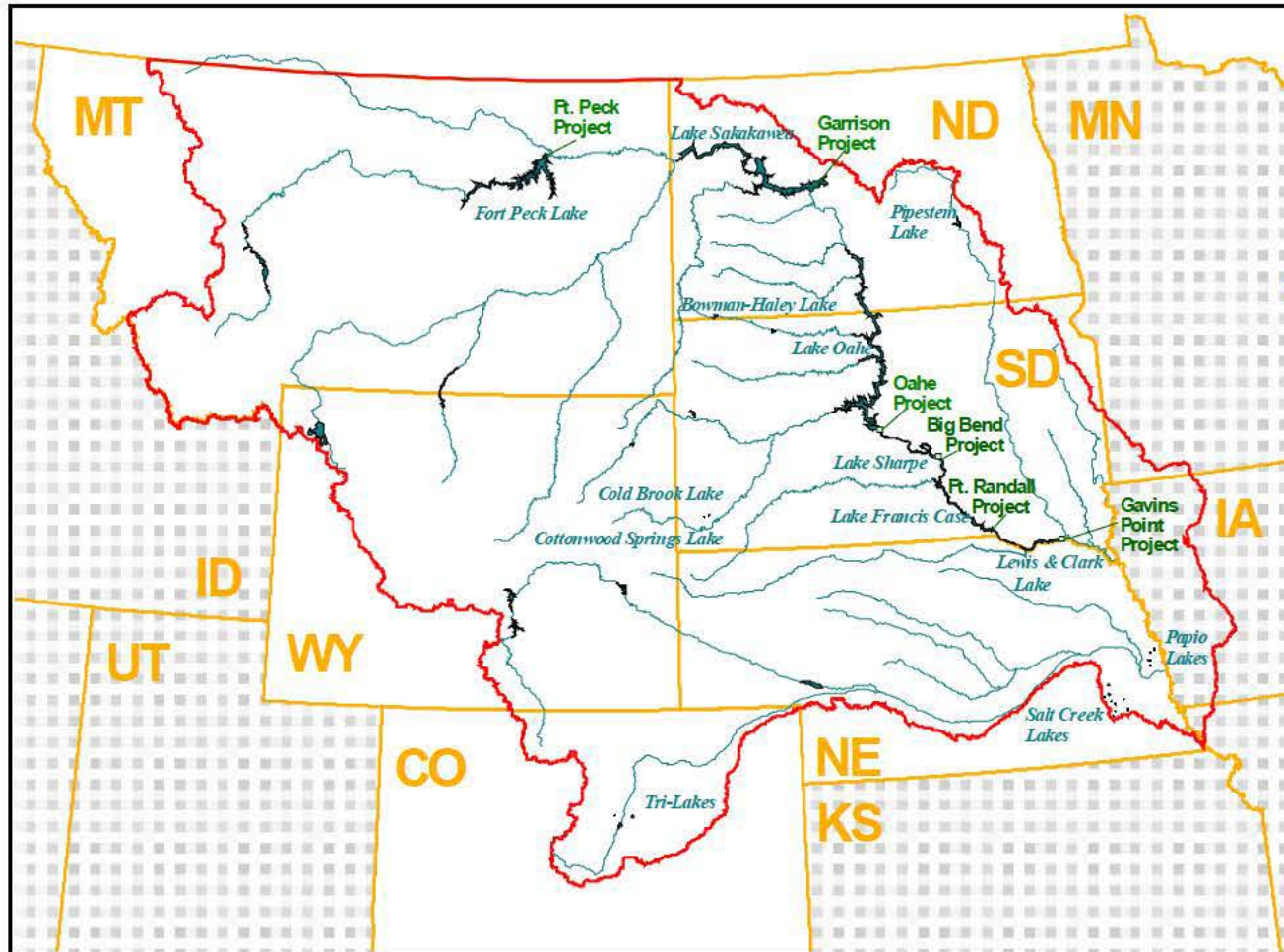
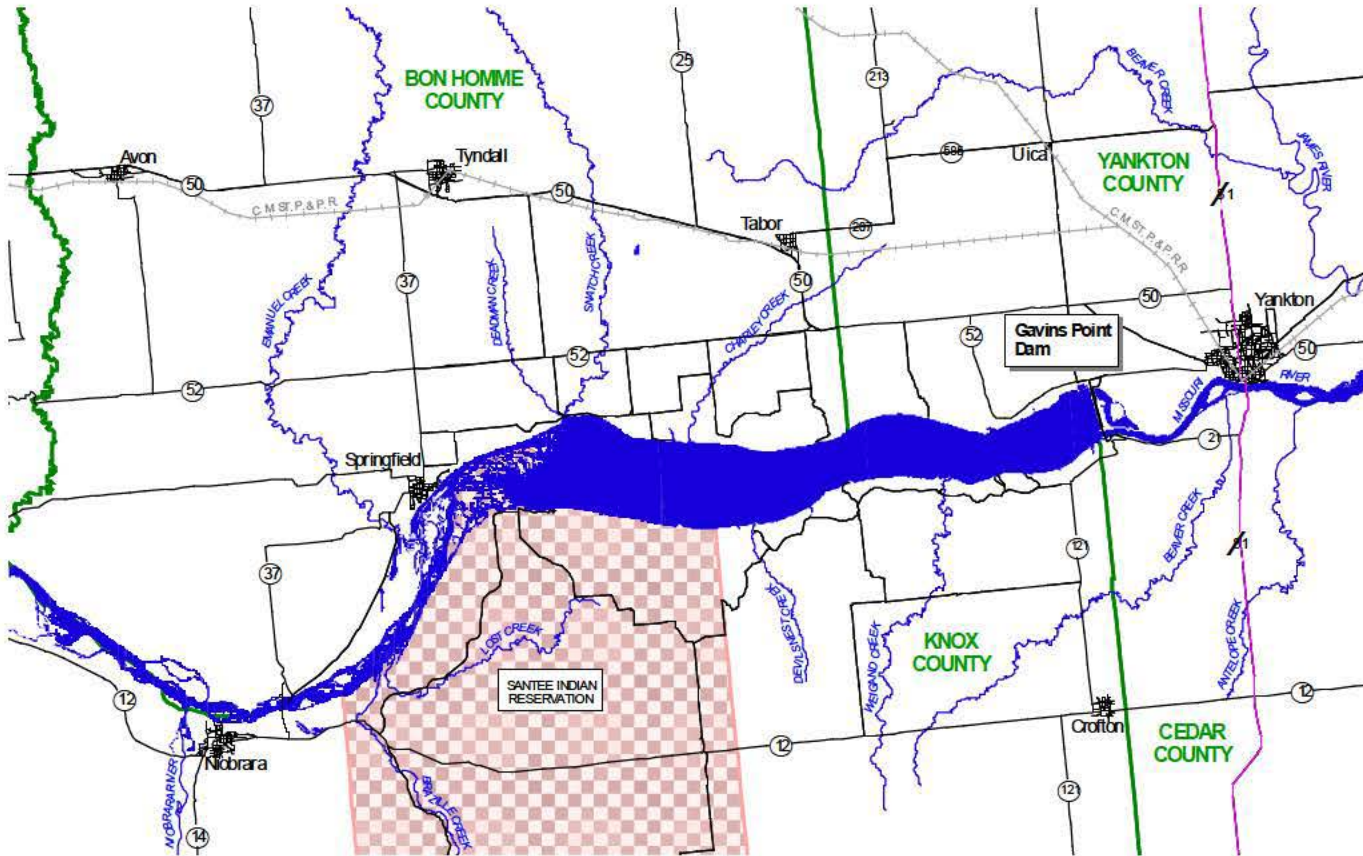


Figure 1-2. Location Map of Gavins Point Project



Gavins Point Dam is the smallest of the six Missouri River main stem dams. The total drainage area of the Missouri River is 529,350 square miles, of which 53 percent is upstream from Gavins Point Dam. The dam was constructed primarily as a reregulation dam for releases from Fort Randall Dam. Reregulated releases assist navigation on the lower Missouri River by supplying a steady flow of water. Three generators generate 754 million kilowatt-hours of electrical energy at Gavins Point each year. Hydroelectric power generated at this project is used by industries, farms, municipalities, and homes in the Pick-Sloan Missouri Basin marketing area.

## **1.2. PROJECT AUTHORIZATION**

The Gavins Point Dam/Lewis and Clark Lake Project was authorized by the Flood Control Act of 1944, Public Law 534, 78th Congress, 2nd Session, along with four other Missouri River main stem projects - Fort Randall, Big Bend, Oahe, and Garrison. These main stem dams are a component of the Pick-Sloan Plan, the comprehensive river basin development program in the Missouri River Basin. Formed from separate proposals recommended by the Bureau of Reclamation and the Corps of Engineers, the Pick-Sloan Plan was one of the first of such plans nationwide that recognized the role of tributary basins and the importance of comprehensive planning in flood control. Fort Peck Dam, located in northern Montana, was constructed prior to the Pick-Sloan Plan but is operated as part of the Missouri River main stem system.

## **1.3. PROJECT PURPOSES**

The Gavins Point Dam/Lewis and Clark Lake Project is a unit of the comprehensive plan for development in the Missouri River basin. Criteria described in the Missouri River Master Water Control Manual are formulated to ensure water management in accordance with the project purposes described below.

### **1.3.1. Flood Control**

All other authorized purposes and functions are subordinate to the flood control mission of the project. The Gavins Point project provides 59,000 acre-feet of exclusive flood control storage. Flood control projects in the entire Missouri River basin are estimated to have prevented over \$26.0 billion in flood damages in the period 1938-2002 (indexed to 1997 \$), during which the Gavins Point project is credited with preventing \$322 million in damages.

### **1.3.2. Navigation**

Although navigation on the Missouri River originally passed through South Dakota, there is no commercial navigation through this reach of the river today. Commercial navigation on the Missouri River is largely confined to the river at and downstream from Sioux City, Iowa. The project is operated to provide stabilized flows for navigation.

### **1.3.3. Hydropower**

A primary purpose of the Gavins Point project is to maintain the system release rate for the six main stem reservoirs. The larger Fort Randall Dam (upstream of Gavins Point Dam) has the capacity to store the daily, weekly, and seasonal power release fluctuations from the larger upstream hydropower plants. Gavins Point Dam, which has much less storage capacity than Fort Randall Dam, can store only the fluctuations in the daily release rate from the Fort Randall hydropower plant. The amount of power produced at the Gavins Point powerhouse rarely changes during the course of a day, a reflection of the constant water release rates maintained to meet downstream commitments to navigation and to other project purposes.

### **1.3.4. Fish and Wildlife**

Project lands classified as either "Operations" or "Recreation" are managed for incidental benefit to wildlife through a variety of techniques including vegetative management. The remaining project lands are also managed to enhance and benefit wildlife species and vegetation where compatible and feasible.

### **1.3.5. Recreation**

The Gavins Point Dam/Lewis and Clark Lake Project is managed to provide a high quality outdoor recreation experience. Recreation at Lewis and Clark Lake is predominantly water-based, with boating and fishing as major activities. In addition, a significant amount of hunting takes place on project lands. Recreation areas located on Lewis and Clark Lake range from undeveloped lake access points to highly developed and extensively used campgrounds.

### **1.3.6. Irrigation**

Numerous private irrigators utilize water from the lake and from the river below the dam.

### **1.3.7. Municipal and Industrial Water Supply**

It is essential that the reservoir be operated in a manner to provide sufficient streamflow in the lower Missouri River downstream from Yankton in order to sustain public water supplies for the numerous communities along the banks of the river. Water within the reservoir is available for rural water supply in both Nebraska and South Dakota.

## **1.4. PURPOSE AND SCOPE OF THE MASTER PLAN**

### **1.4.1. Purpose**

The Master Plan provides guidelines and direction for project development and use. It is based on responses to regional and local needs, resource capabilities and suitability, and expressed public interests consistent with authorized project purposes and pertinent legislation. The Master Plan provides a District-level policy consistent with national objectives and other State and regional goals and programs. This Master Plan includes guidance for the use and development of the natural and manmade resources at the Gavins Point Dam/Lewis and Clark Lake Project. The plan includes: (1) a comprehensive description of the project; (2) a discussion of factors influencing resource management and development; (3) an identification and discussion of special problems; (4) a synopsis of public involvement and input; and (5) descriptions of present and future land use classification for all management units at the project.

The Master Plan is distinct from the project-level implementation of the Operational Management Plan (OMP), which defines specific development needs at management units. Policies in the Master Plan are guidelines implemented through provisions of the OMP, specific Design Memorandums, and the Annual Management Plans. The broad intent of this Gavins Point Master Plan is to document policies and analyses that do the following:

1. Determine appropriate land use classifications and levels of development of project resources;
2. Provide guidelines within which the OMP and Annual Management Plans can be developed and implemented; and
3. Establish a basis on which outgrants and recreational development proposals can be evaluated.

This updated Master Plan has been prepared in accordance with guidance contained in Engineering Regulation (ER) 1130-2-550 (Project Operations – Recreation Operations and Maintenance Policies, 15 November 1996; Engineer Pamphlet (EP) 1130-2-550 (Project Operations-Recreation Operations and Maintenance Guidance and Procedures), 15 November 1996. Engineer Manual (EM) 1110-1-400, (Engineering and Design - Recreation Planning and Design Criteria), 31 July 1987; Engineering Regulation (ER) 200-2-2 (Environmental Quality - Procedures for Implementing the National Environmental Policy Act (NEPA)), 4 March 1998; ER 1105-2-100 (Planning Guidance) 22 April 2000; ER 1165-2-400 (Water Resource Policies and Authorities - Recreation Planning, Development, and Management Policies) 9 August 1985.

#### **1.4.2. Scope**

This master plan represents overall policy and management concepts applicable to the Gavins Point Project. Detailed cost estimates are not appropriate for Master Plans because they soon become outdated. Specific development needs are presented in the more frequently updated Operational Management Plan for the project. The lifespan of this updated Master Plan is intended to direct the use and development of the project resources for a minimum period of five years.

Lands transferred in fee title under Title VI of Public Law (P.L.) 105-53, Water Resources Development Act of 1999, as amended by P.L. 106-541, Water Resources Development Act of 2000, are included in this Master Plan. These lands will be managed in perpetuity for the restoration of terrestrial wildlife habitat loss that occurred as a result of flooding related to the Gavins Point project and other reservoir projects carried out as part of the Pick-Sloan Missouri River Basin Program.

Under the provisions of Title VI, the Government retains fee title to lands and structures necessary for continuation of the operation, maintenance, repair, replacement rehabilitation, and structural integrity of Gavins Point Dam and related flood control and hydropower structures, including land below the top of the exclusive flood control pool. However, the Government may lease in perpetuity all or part of certain recreation areas associated with the Gavins Point Dam/Lewis and Clark Lake Project. Table 1-1 shows management areas transferred in fee or leased in perpetuity. Table 6-2 in Section 6.1 of this Master Plan provides additional detail on Corps recreation sites and Title VI transfers.

**Table 1-1. Management Units Transferred or Leased Under Title VI**

| <b>Transfers*</b>  |                       |                         |
|--|-----------------------|-------------------------|
| <b>Management Units</b>  | <b>Transferred To</b> | <b>Date of Transfer</b> |
| MU <sup>1</sup> #s 1, 2, and 3. Lewis and Clark Recreation Area (less the part on dam abutment, which is leased) | SDGFP <sup>2</sup>    | January 26, 2002        |
| MU #1. Yankton Unit  | SDGFP                 | January 26, 2002        |
| MU #2. Midway Unit   | SDGFP                 | January 26, 2002        |
| MU #3. Gavins Point Unit   | SDGFP                 | January 26, 2002        |
| MU #4. Gavins to Lesterville   | SDGFP                 | January 26, 2002        |
| MU #5. Lesterville   | SDGFP                 | January 26, 2002        |
| MU #6. Boy Scout Camp to Tabor   | SDGFP                 | January 26, 2002        |
|  |                       |                         |
| MU #7. Tabor   | SDGFP                 | January 26, 2002        |
| MU #13. Sand Creek   | SDGFP                 | January 26, 2002        |
| MU #15. Springfield Recreation Area  | SDGFP                 | January 26, 2002        |
| MU #53. Chief White Crane  | SDGFP                 | January 26, 2002        |
| MU #54. Sewage Lagoons   | SDGFP                 | January 26, 2002        |
| <b>Leases in Perpetuity</b>  |                       |                         |
| <b>Management Area</b>   | <b>Lessee</b>         | <b>Date of Lease</b>    |
| MU #19. Running Water  | SDGFP                 | February 9, 2002        |
| MU #58. Pierson Ranch  | SDGFP                 | February 9, 2002        |

1/MU# = Management Unit Number

2/SDGFP = South Dakota Department of Game, Fish, and Parks

\* All areas, other than those transferred, remain in Federal ownership (see Table 2-20).

## 1.5. PROJECT-WIDE RESOURCE OBJECTIVES

The function of the Gavins Point Master Plan is broader than guiding the construction and use of recreational facilities. The Master Plan also guides the stewardship of project resources, both

natural and manmade. Sound stewardship requires the development and management of project resources for the public benefit, consistent with resource capabilities. An important component of this approach is the establishment of viable resource objectives.

Resource objectives are realistically attainable goals for the use, development, and management of natural and manmade resources. They are guidelines for obtaining maximum public benefits while minimizing adverse impacts and protecting and enhancing environmental quality. They are developed with full consideration of authorized project purposes, applicable Federal laws and directives, resource capabilities, regional needs, plans and goals of regional and local governmental units, and expressed public desires. The project-wide resource objectives for Lewis and Clark Lake, not in priority order, are as follows:

- To develop and manage land and waters in full cooperation and coordination with other public management agencies and appropriate private sectors;
- To develop and manage project lands and waters to support various types and levels of recreation activities consistent with carrying capacities and aesthetic, cultural, and ecological values;
- To provide public education about the history of the area, project resources, and the Corps' role in developing and managing these resources;
- To develop and manage the project lands and waters to support a diversity of fish and wildlife species;
- To preserve and protect threatened and endangered species and unique and important ecological and aesthetic resources;
- To maintain and manage project lands and waters to support regional management programs;
- To protect and interpret significant cultural resource sites;
- To maintain a reservoir water supply of high quality for irrigation, water supply, recreation, fish and wildlife use; and
- To manage resources in response to sedimentation trends.

Specific resource objectives for each of the land use classifications identified for Gavins Point Dam/Lewis and Clark Lake Project lands are found in Chapter 5.



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## **2. FACTORS INFLUENCING RESOURCE MANAGEMENT AND DEVELOPMENT**

This chapter provides an overview of key factors that influence and constrain present and future options for the use, management, and development of land and water resources at the Gavins Point Dam/Lewis and Clark Lake project. These factors fall into three general, somewhat interrelated categories: natural resources, historical and social resources, and administrative and policy factors. An analysis of these factors, as well as regional needs and desires, results in a framework that minimizes the adverse impacts to the environment, and resolves the competing and conflicting uses. The information presented in this chapter was used for the resource plan that determines land use classifications, develops project-wide resource objectives, and guides identification of specific facility needs in the OMP.

### **2.1. DESCRIPTION OF THE RESERVOIR**

Gavins Point Dam was one of the five Pick-Sloan dams to be completed on the Missouri River and became fully operational in 1955. The reservoir (Lewis and Clark Lake) impounded by Gavins Point Dam extends 25 miles from the dam four miles west of Yankton, South Dakota to near Springfield, South Dakota. At its maximum normal operating pool elevation of 1,208 feet above mean sea level (m.s.l.), the reservoir has a surface area of roughly 28,000 acres and 90 miles of shoreline at the pool elevation of 1,204.5 m.s.l. At its maximum operating pool elevation of 1,210 ft. m.s.l., the storage capacity of the reservoir is approximately 470,000 acre-feet.

### **2.2. LAKE OPERATION**

Numerous reservoirs and impoundments constructed by different interests for flood control, irrigation, power production, recreation, water supply, and fish and wildlife are located throughout the basin. The most significant of these structures have been constructed by the Bureau of Reclamation and the Corps of Engineers. Although primarily constructed for irrigation and power production, the projects constructed by the Bureau of Reclamation do provide some limited flood control in the upper basin. Six main stem dams constructed by the Corps are the most significant authorized flood control projects within the basin, providing a combined capacity in excess of 73.5 million acre-feet of which more than 16 million acre-feet is for flood control.

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These six projects were completed in 1964 and provide flood protection by controlling runoff from the upper 279,000 square miles of the Missouri River basin. The six main stem reservoirs operated by the Corps of Engineers are listed in Table 2-1.

**Table 2-1. Missouri River Main Stem Flood Control Reservoirs**

| <b>PROJECT</b> | <b>INCREMENTAL<br/>DRAINAGE AREA<br/>(Square Miles)</b> | <b>CLOSURE<br/>DATE</b> | <b>FLOOD CONTROL AND<br/>MULTIPLE USE<br/>STORAGE (KAF)</b> | <b>TOTAL<br/>STORAGE<br/>(KAF)</b> |
|----------------|---|-------------------------|---|------------------------------------|
| Fort Peck      | 57,500  | 1937                    | 2,717   | 18,688                             |
| Garrison       | 123,900   | 1953                    | 4,222   | 23,821                             |
| Oahe           | 62,090  | 1958                    | 3,201   | 23,137                             |
| Big Bend       | 5,840   | 1963                    | 117   | 1,859                              |
| Fort Randall   | 14,150  | 1952                    | 1,309   | 5,418                              |
| Gavins Point   | 16,000  | 1955                    | 90  | 470                                |

Regulation of the main stem reservoir system follows a repetitive annual cycle. Winter snows and spring and summer rains produce most of the year's water supply, which results in rising pools. After reaching a peak, usually during July, stored water declines until late winter when the cycle begins anew. A similar pattern may be found in rates of releases from the system, with the higher levels of flows from mid-March to late November, followed by low rates of winter discharge from late November until mid-March, after which the cycle repeats.

Two primary high-risk flood seasons are the plains snowmelt season extending from late February through April and the mountain snowmelt period extending from May through July. Overlapping the two snowmelt flood seasons is the primary rainfall flood season, which includes both upper and lower basin regulation considerations. The highest average power generation period extends from mid-April to mid-October with high peaking loads during the winter heating season (mid-December to mid-February) and the summer air conditioning season (mid-June to mid-August). The power needs during winter are supplied primarily with Fort Peck and Garrison releases and the peaking capacity of Oahe and Big Bend.

During the spring and summer period, releases are geared to navigation, flood control, and other requirements and primary power loads are supplied using the four lower dams. During the fall

when power needs diminish, the Fort Randall pool is drawn down to permit generation during the winter period when the pool is refilled by Oahe and Big Bend peaking power releases. The major maintenance period for the main stem power facilities extends from mid-February through May and from September to mid-November which normally are the lower demand and off-peak energy periods. The exception is Gavins Point, where maintenance is performed after the end of the navigation season since all three generators are normally required to provide navigation flow needs.

Normally, the navigation season extends from April 1 through December 1 during which time reservoir releases are increased to meet downstream target flows in combination with downstream tributary inflows. Much of the increased flow for navigation comes from the large carryover storage in Oahe Reservoir. Winter releases after the close of navigation season are much lower and vary depending on the need to conserve or evacuate main stem storage volumes, downstream ice conditions permitting. Minimum release restrictions and pool fluctuations for fish spawning management generally occur from April 1 through July. Endangered and threatened species, including the interior least tern and piping plover, nest from early May through August. During this period, special release patterns are made from Garrison, Fort Randall, and Gavins Point to avoid flooding nesting sites on low-lying sandbars and islands downstream from these projects.

Overall, the general regulation principles presented above provide the backbone philosophy for main stem system regulation. Detailed operation plans are developed, followed, and adjusted as warranted by monitored day-to-day conditions. Beginning in 1953, projected operation of the Missouri River main stem reservoir system for the year ahead was developed annually as a basis for advance coordination with the various interested Federal, State, and local agencies, and private citizens. These regulation schedules are prepared by the Reservoir Control Center, Missouri River Regional Office, Corps of Engineers.

In addition to the six main stem projects operated by the Corps, 65 tributary reservoirs operated by the Bureau of Reclamation and the Corps provide over 15 million acre-feet of flood control storage. The Bureau of Reclamation operates many additional reservoirs for irrigation and power production, which provide incidental flood control benefits.

### 2.2.1. Statistical Analysis

A statistical analysis of reservoir operation is presented that examines pool and release duration and probability for Lewis and Clark Lake. Pool duration and release duration relationships were based on observed data from historical reservoir operation records and on simulated data from reservoir operation studies. Pool-probability and release-probability relationships were also derived from historical records reflecting actual reservoir regulation and from the results of model simulation studies reflecting current regulation criteria over a long-term hydrologic record. Results of these analyses were compared with the previously developed relationships from the Missouri River Main Stem Reservoirs Hydrologic Statistics, RCC Technical Report F-99, published by the Missouri River Region Reservoir Control Center (MRR-RCC). The RCC Technical Report F-99 also contains a description of the assumptions used in the long-term computer model simulation studies. The RCC Technical Report F-99 study was based on 31 years of actual historical data from the period of 1967 through 1997 and simulated a longer period of record (1898 to 1997) using the Daily Routing Model (DRM). Updated duration and frequency relationships for this report use observed historical data from June 1967 through June 2002.

#### Pool Duration

Pool duration relationships are used to define the percent of time that a given pool elevation is equaled or exceeded, while release duration relationships represent the percent of time that a given release from the reservoir is equaled or exceeded. Duration curves represent the cumulative distribution function of all data recorded at the site, and can be based on annual or seasonal periods. Seasonal duration curves can be defined to represent particular months or seasons such as the navigation or non-navigation season. A duration curve is not a probability curve. It should not be interpreted on an annual event basis because it provides only the fraction of time that a given event was exceeded and not the annual probability of an event occurring. It can be used to determine the average number of days per year that a particular magnitude is equaled or exceeded if it is an annual duration curve or the number of days during a particular month or season if it is a seasonal duration curve. Duration curves are developed using class interval analysis. Class interval analysis involves subdividing the data into defined class intervals and computing the relative frequency of each class interval based on the number of data within each class. For this report monthly and annual pool duration relationships were developed using the HEC-STATS computer program with daily data. Table 2-2 shows the observed and simulated annual pool elevation duration relationships for various percentages of time in which the values are equaled or exceeded. Table 2-3 shows observed monthly pool elevation duration relationships.

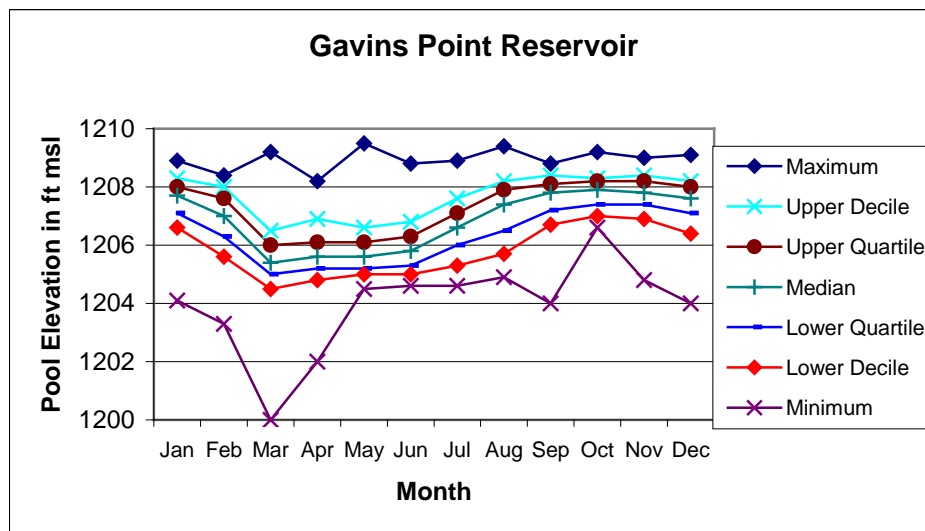
**Table 2-2. Annual Pool Duration Relationships, Lewis and Clark Lake**

| <b>Percent of Time<br/>Equaled or Exceeded</b> | <b>Observed<br/>1967 – 2002<br/>Pool Elevation<br/>(ft m.s.l.)</b> | <b>Simulated, DRM<br/>RCC F-99<br/>Pool Elevation<br/>(ft m.s.l.)</b> |
|--|--|---|
| 0  | 1,209.5  | 1,209.3   |
| 1  | 1,208.6  | 1,207.9   |
| 5  | 1,208.4  | 1,207.4   |
| 10   | 1,208.2  | 1,207.2   |
| 20   | 1,207.9  | 1,207.1   |
| 50   | 1,206.9  | 1,206.4   |
| 80   | 1,205.6  | 1,205.9   |
| 90   | 1,205.2  | 1,205.7   |
| 95   | 1,204.9  | 1,205.5   |
| 99   | 1,204.3  | 1,205.1   |
| 100  | 1,200.0  | 1,200.8   |

**Table 2-3. Monthly Pool Duration Relationships, Lewis and Clark Lake**

| <b>Percent of<br/>Time<br/>Equaled or<br/>Exceeded</b> | <b>Pool Elevation (ft m.s.l.)</b> |            |            |            |            |            |            |            |            |            |            |            |
|--|-----------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|  | <b>Jan</b>                        | <b>Feb</b> | <b>Mar</b> | <b>Apr</b> | <b>May</b> | <b>Jun</b> | <b>Jul</b> | <b>Aug</b> | <b>Sep</b> | <b>Oct</b> | <b>Nov</b> | <b>Dec</b> |
| 0  | 1,208.9                           | 1,208.4    | 1,209.2    | 1,208.2    | 1,209.5    | 1,208.8    | 1,208.9    | 1,209.4    | 1,208.8    | 1,209.2    | 1,209.0    | 1,209.1    |
| 1  | 1,208.8                           | 1,208.3    | 1,208.1    | 1,208.0    | 1,208.0    | 1,208.0    | 1,208.4    | 1,208.5    | 1,208.7    | 1,208.6    | 1,208.8    | 1,208.6    |
| 5  | 1,208.4                           | 1,208.2    | 1,207.0    | 1,207.4    | 1,206.9    | 1,207.2    | 1,207.8    | 1,208.3    | 1,208.5    | 1,208.4    | 1,208.6    | 1,208.3    |
| 10   | 1,208.3                           | 1,208.0    | 1,206.5    | 1,206.9    | 1,206.6    | 1,206.8    | 1,207.6    | 1,208.2    | 1,208.4    | 1,208.3    | 1,208.4    | 1,208.2    |
| 20   | 1,208.1                           | 1,207.8    | 1,206.2    | 1,206.3    | 1,206.2    | 1,206.4    | 1,207.2    | 1,208.0    | 1,208.2    | 1,208.2    | 1,208.2    | 1,208.1    |
| 25   | 1,208.0                           | 1,207.6    | 1,206.0    | 1,206.1    | 1,206.1    | 1,206.3    | 1,207.1    | 1,207.9    | 1,208.1    | 1,208.2    | 1,208.2    | 1,208.0    |
| 50   | 1,207.7                           | 1,207.0    | 1,205.4    | 1,205.6    | 1,205.6    | 1,205.8    | 1,206.6    | 1,207.4    | 1,207.8    | 1,207.9    | 1,207.8    | 1,207.6    |
| 75   | 1,207.1                           | 1,206.3    | 1,205.0    | 1,205.2    | 1,205.2    | 1,205.3    | 1,206.0    | 1,206.5    | 1,207.2    | 1,207.4    | 1,207.4    | 1,207.1    |
| 80   | 1,207.0                           | 1,206.1    | 1,204.9    | 1,205.1    | 1,205.1    | 1,205.2    | 1,205.8    | 1,206.2    | 1,207.0    | 1,207.2    | 1,207.2    | 1,207.0    |
| 90   | 1,206.6                           | 1,205.6    | 1,204.5    | 1,204.8    | 1,205.0    | 1,205.0    | 1,205.3    | 1,205.7    | 1,206.7    | 1,207.0    | 1,206.9    | 1,206.4    |
| 95   | 1,206.1                           | 1,205.3    | 1,204.1    | 1,204.6    | 1,204.9    | 1,204.9    | 1,205.0    | 1,205.3    | 1,206.4    | 1,206.9    | 1,206.5    | 1,205.8    |
| 99   | 1,205.2                           | 1,204.1    | 1,200.4    | 1,204.1    | 1,204.7    | 1,204.8    | 1,204.8    | 1,205.0    | 1,205.4    | 1,206.8    | 1,205.1    | 1,204.7    |
| 100  | 1,204.1                           | 1,203.3    | 1,200.0    | 1,202.0    | 1,204.5    | 1,204.6    | 1,204.6    | 1,204.9    | 1,204.0    | 1,206.6    | 1,204.8    | 1,204.0    |

Figure 2-1 shows the maximum, median, and minimum pool elevations for each month along with the upper and lower decile and quartiles. The Upper Quartile relationships represent the pool elevation equaled or exceeded 25% of the time. The Lower Quartile relationships are the pool elevations equaled or exceeded 75% of the time. The Upper and Lower Decile relationships represent pool elevations equaled or exceeded 10% and 90% of the time respectively. The median pool elevation represents the elevation equaled or exceeded 50% of the time.



**Figure 2-1. Monthly Pool Duration Relationships**

### Release Duration

Table 2-4 shows observed and simulated annual release duration relationships for percentages of time where values are equaled or exceeded. Table 2-5 shows observed monthly release duration relationships.

**Table 2-4. Gavins Point Annual Release Duration Relationships**

| Percent of Time<br>Equaled or Exceeded | 1967 - 2002<br>Observed<br>Release (c f.s.) | RCC F-99 Simulated,<br>DRM Release (c f.s.) |
|--|---|---|
| 0                                      | 70,100                                      | 75,600                                      |
| 1                                      | 62,700                                      | 63,600                                      |
| 5                                      | 51,800                                      | 51,500                                      |
| 10                                     | 44,400                                      | 43,100                                      |
| 20                                     | 35,100                                      | 34,900                                      |
| 50                                     | 28,900                                      | 27,900                                      |
| 80                                     | 17,500                                      | 16,100                                      |
| 90                                     | 14,800                                      | 12,000                                      |
| 95                                     | 12,000                                      | 9,500                                       |
| 99                                     | 8,600                                       | 6,200                                       |
| 100                                    | 6,200                                       | 5,600                                       |

**Table 2-5. Gavins Point Monthly Release Duration Relationships**

| Percent of Time<br>Equaled or<br>Exceeded | Release (c.f.s.) |        |        |        |        |        |        |        |        |        |        |        |
|---|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|   | Jan              | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec    |
| 0   | 31,000           | 34,700 | 42,000 | 58,000 | 60,000 | 60,100 | 62,000 | 65,100 | 68,000 | 70,100 | 70,100 | 68,000 |
| 1   | 28,800           | 29,900 | 36,600 | 55,700 | 59,000 | 59,200 | 61,900 | 63,500 | 64,500 | 68,300 | 68,300 | 48,800 |
| 5   | 24,700           | 28,000 | 33,800 | 40,900 | 44,000 | 46,700 | 52,800 | 59,300 | 59,300 | 59,000 | 58,700 | 37,500 |
| 10  | 23,300           | 24,400 | 32,000 | 34,300 | 37,400 | 40,700 | 45,700 | 52,100 | 52,200 | 52,400 | 53,300 | 32,900 |
| 20  | 21,100           | 22,800 | 28,000 | 32,400 | 33,700 | 35,500 | 39,800 | 45,700 | 46,500 | 46,600 | 44,500 | 23,800 |
| 25  | 20,800           | 21,600 | 26,300 | 31,100 | 33,200 | 34,700 | 37,700 | 42,300 | 43,300 | 43,900 | 43,000 | 23,200 |
| 50  | 17,200           | 17,500 | 20,000 | 27,500 | 29,900 | 31,100 | 32,900 | 33,400 | 33,900 | 34,000 | 33,700 | 17,600 |
| 75  | 15,000           | 15,400 | 16,000 | 21,900 | 25,200 | 26,500 | 29,300 | 30,800 | 31,000 | 30,400 | 25,300 | 15,600 |
| 80  | 14,300           | 14,500 | 15,000 | 20,800 | 23,400 | 24,900 | 28,300 | 30,000 | 30,200 | 29,500 | 21,000 | 14,900 |
| 90  | 12,900           | 13,100 | 10,900 | 15,300 | 20,200 | 21,200 | 24,000 | 27,200 | 27,900 | 27,000 | 10,500 | 12,400 |
| 95  | 11,900           | 11,000 | 9,000  | 11,500 | 17,200 | 16,300 | 21,500 | 22,300 | 22,500 | 21,800 | 9,100  | 11,800 |
| 99  | 10,800           | 9,100  | 7,100  | 8,000  | 14,400 | 11,200 | 7,100  | 10,000 | 17,600 | 10,300 | 7,700  | 9,100  |
| 100                                       | 7,900            | 7,700  | 6,100  | 6,100  | 10,300 | 6,100  | 6,100  | 7,100  | 7,600  | 7,700  | 7,600  | 8,100  |



## Pool Probability

Pool-probability relationships are used to define the annual probability of the reservoir pool level reaching or exceeding a certain elevation. Current standards are to express the probability in terms of annual percent chance of exceedance. The percent chance of exceedance is equal to the annual exceedance probability multiplied by 100. Once the exceedance probability is estimated, the recurrence interval or return period can be computed as the reciprocal of the exceedance probability. Table 2-6 shows adopted pool elevation probability relationships from the RCC Technical Report F-99.

**Table 2-6. Pool Elevation Probability**

| <b>Percent Chance<br/>Exceedance</b> | <b>Return Period<br/>(years)</b> | <b>Elevation<br/>(feet m.s.l.)</b> |
|--------------------------------------|----------------------------------|------------------------------------|
| 50                                   | 2                                | 1,208.8                            |
| 20                                   | 5                                | 1,209.0                            |
| 10                                   | 10                               | 1,209.2                            |
| 2                                    | 50                               | 1,209.6                            |
| 1                                    | 100                              | 1,210.0                            |
| 0.2                                  | 500                              | 1,211.0                            |

## Release Probability

Release-probability relationships are used to define the annual probability of making a release from the reservoir equal to or greater than a certain discharge. For an uncontrolled reservoir, the release probability relationship may be derived directly from the pool probability relationship and a fixed elevation-outflow relationship since the maximum outflow is a function of the maximum pool elevation. For a regulated reservoir, such as those that comprise the Missouri River main stem reservoir system, the release-probability relationship must be determined independently of the pool-probability relationship since maximum releases do not necessarily correspond with maximum pool elevations.

For the Gavins Point project, maximum releases are dependant on a variety of factors in addition to the pool elevation within the reservoir. These factors include downstream flow targets for flood control, navigation, water supply, and environmental needs, hydropower requirements, recreation, and intrasystem balancing for all authorized purposes. Duration of the maximum releases can vary considerably from year to year. Therefore, if the duration or volume of the maximum releases is of concern, the release probability relationships defined in this report should not be used. Table 2-7 shows adopted release probability relationships from the RCC Technical Report F-99.

**Table 2-7. Release Probability**

| <b>Percent Chance<br/>Exceedance</b> | <b>Return Period<br/>(years)</b> | <b>Release (c.f.s.)</b> |
|--------------------------------------|----------------------------------|-------------------------|
| 50                                   | 2                                | 38,000                  |
| 20                                   | 5                                | 47,000                  |
| 10                                   | 10                               | 54,000                  |
| 2                                    | 50                               | 72,000                  |
| 1                                    | 100                              | 80,000                  |
| 0.2                                  | 500                              | 100,000                 |

A review and update of the Missouri River Main Stem Reservoir Master Water Control Manual was initiated by the Missouri River Division in November 1989. An extensive effort is being made to involve interested parties from the affected states and the public in this review. The revised draft environmental impact statement, released in August 2001, identifies the impacts associated with six alternative operational plans for the Missouri River main stem reservoir system. The Master Manual Review and Update study is scheduled to be implemented in 2004.

### **2.2.2. Effects of Operations on Recreation**

Recreation opportunities on Lewis and Clark Lake, especially motorized boating, fishing, and swimming, are affected by fluctuations in the amount of water flowing through the Missouri River system. Low water levels during the March to August major flood season have a negative effect on boating, particularly in the upstream third of the lake. The low water level, combined

with the growing delta and encroaching marsh vegetation, significantly limits boating opportunities.

### **2.2.3. Effects of Operations on Fish and Wildlife**

Water level operation patterns for Lewis and Clark Lake do not allow for optimum reproductive conditions for fish spawning. The process of holding reservoir levels down in the spring to allow space for storage of potential floodwaters and raising water levels in summer and fall is the reverse of what is required for good fish spawning. Stable water conditions during the spring, however, should allow species such as walleye, sauger, and white bass to successfully reproduce.

Beginning in 1986 water releases from Gavins Point Dam were regulated to protect the habitat used by two Federally listed threatened and endangered species, the interior least tern and the piping plover. These birds nest on barren sandbars close to the water surface downstream from the Gavins Point Dam on the Missouri National Recreational River.

## **2.3. HYDROLOGY AND GROUND WATER**

### **2.3.1. Hydrology**

The Missouri River rises along the Continental Divide in the northern Rocky Mountains and flows generally easterly and southeasterly to join the Mississippi River near St. Louis, Missouri. The river drains approximately 9,700 square miles of Canada and 513,300 square miles or one-sixth of the contiguous United States. Its headwaters begin near Three Forks, Montana where the Madison River, the Jefferson River, and the Gallatin River join to form the Missouri River. From there it travels 2,315 square miles to its confluence making it the longest river in the United States. Basin topography varies from the 56,000-square mile Rocky Mountain area in the west, where many peaks exceed 14,000 feet in elevation, to the approximately 370,000-square mile Great Plains area in the heartland of the basin, to the 90,000- square mile Central Lowlands area in the lower basin where the elevation is 450 NGVD near the mouth at St. Louis, Missouri. The Black Hills in South Dakota and the Ozarks in Missouri, consisting of 13,000 square miles, are isolated dome-like uplifts that have been eroded into a hilly and mountainous topography. Stream slopes vary from about 200 feet per mile in the mountains to about 0.9 foot per mile in the Great Plains and Central Lowlands.

Major Missouri River tributaries are the Yellowstone River, which drains an area of 70,000 square miles, joining the Missouri River near the Montana-North Dakota border; the Platte River, with a 90,000 square mile drainage area entering the Missouri River in eastern Nebraska; and the Kansas River, which empties into the Missouri River in eastern Kansas and drains an area of approximately 60,000 square miles. A prominent feature in the drainage pattern of the upper portion of the basin is that every major tributary, with the exception of the Milk River, is a right bank tributary flowing to the east or to the northeast. Only in the extreme lower basin, below the mouth of the Kansas River, is there a fair balance reached between left and right bank major tributaries. The direction of flow of the major tributaries is of particular importance from the standpoint of the potential concentration of flows from storms that typically move across the basin in an easterly direction. It is also important in another respect on the Yellowstone River, since early spring temperatures in the headwaters of the Yellowstone and its tributaries are normally from 8 to 12 degrees Fahrenheit higher than along the northernmost reach of the Missouri near the Yellowstone confluence. This ordinarily results in ice breakup on the Yellowstone prior to the time the ice goes out of the Missouri River, thereby contributing to ice jam floods along the Missouri River downstream from the confluence to near Williston, North Dakota.

The broad range in latitude, longitude, and elevation of the Missouri River basin and its location near the geographical center of the North American continent results in a wide variation in climatic conditions. The climate of the basin is produced largely by interactions of three great air masses that have their origins over the Gulf of Mexico, the northern Pacific Ocean, and the northern polar regions. They regularly invade and pass over the basin throughout the year, with the Gulf air tending to dominate the weather in summer and the polar air dominating in winter. This seasonal domination by the air masses and the frontal activity caused by their collisions produce the general weather regimens found within the basin. As is typical of continental-interior plains area, the variations from normal climatic conditions from season to season and from year to year are extreme. The outstanding climatic rarity in the basin was the severe drought of the 1930s when excessive summer temperatures and subnormal precipitation continued for more than a decade.

Streams having their source in the Rocky Mountains are fed by snowmelt. They are clear flowing and have steep gradients with cobble-lined channels. Stream valleys often are narrow in the mountains onto the outwash plains. Flood flows in this area are generally associated with the snowmelt runoff period occurring in May and June. Occasionally, summer rainfall floods having high, sharp peaks occur in the lower mountainous areas, such as the Rapid City flood in June 1972 and the Big Thompson River flood in July 1976.

Streams flowing across the plains area of Montana, Wyoming, and Colorado have variable characteristics. The larger streams with tributaries originating in the mountain areas carry sustained spring and summer flows from mountain snowmelt, and they have moderately broad alluvial valleys. Streams originating locally often are wide, sandy-bottomed, and intermittent, and they are subject to high peak rainfall floods.

In the plains region of North and South Dakota, Nebraska, and Kansas, with the exception of the Nebraska sandhills area, streams generally have flat gradients and broad valleys. Except for the Platte River, most of the streams originate in the plains area and are fed by snowmelt in the early spring and rainfall runoff throughout the warm season. Stream flow is erratic. Stream channels are small for the size of the drainage areas, and flood potentials are high. When major rainstorms occur in the tributary area, streams are forced out of their banks onto the broad floodplains.

In the regions east of the Missouri River, streams have variable characteristics. Those in the Dakotas, such as the Big Sioux and James Rivers, are meandering streams with extremely flat gradients and very small channel capacities in relation to their drainage areas. These areas are generally covered with glacial drift and contain many pothole lakes and marshes. Rainfall in the spring often combines with the annual plains snowmelt to produce floods that exceed channel capacities and spread onto the broad floodplains.

Streams in the Ozark Highlands of Missouri resemble mountain streams with their clear, dependable base flows. Much of the area is underlain by limestone, and there are cavernous underground springs. The hilly terrain produces high peak runoff, which contributes to frequent floods with large volumes due to this area's higher annual rainfall.

The most significant tributary on the right bank of Lewis and Clark Lake is the Niobrara River, which flows through the Sandhills of Nebraska to join the Missouri River near the town of Niobrara. It transports considerable sand and silt. A large portion of these materials is deposited near the mouth where a sandy delta has formed. The bluffs on the south side of the lake are drained by a well-developed pattern of streams that drain a small geographic area. Bazile Creek is a perennial stream, and Beaver and Weigand Creeks are intermittent streams. The tributary stream pattern on the left bank is less extensive. Only Emanuel, Snatch, Sand, and Charley Creeks enter the reservoir from the north, and all four are located in the upper third of the lake. The water in these intermittent drainageways flows in the spring and after heavy rains.

The drainage pattern of the Gavins Point Dam/Lewis and Clark Lake Project is similar to the other Missouri River main stem projects. West of the Missouri River, the drainage pattern is generally well defined. The area upstream of the Gavins Point Dam/Lewis and Clark Lake Project is controlled by the other five major dams on the Missouri River that make up the main stem system. The total drainage system upstream of the Gavins Point project controlled by these five dams comprises 263,480 square miles (sq. mi.). The Lewis and Clark Lake drainage area, controlled by Gavins Point Dam, is approximately 16,000 sq. mi. in size.

### **2.3.2. Groundwater**

The major groundwater sources in this area are the Dakota Sandstone and the Pierre Shale aquifers. These shallow aquifers are low in dissolved solids and do not contain excess concentrations of sodium, bicarbonates, or chlorides. The base flow of the Niobrara River is maintained by groundwater flow from springs during low runoff periods.

## **2.4. ICE AFFECTED FLOWS**

Data is collected on ice affected flows in the vicinity of Gavins Point Dam but flooding because of the formation of river ice is not a problem for this project.

## **2.5. SEDIMENTATION**

Prior to the construction of the six main stem dams, the Missouri River transported 135,000,000 tons of suspended sediment a year (measured at Yankton, SD). Virtually all of this sediment is now deposited in the six reservoirs. Most of this sediment has deposited in the reservoirs upstream of Fort Randall Dam. However, on average over 4,000,000 tons or approximately 2,625 acre-feet of sediment is deposited in the Gavins Point Project each year. The total sediment deposition to the top of the Multiple Use Pool (elevation 1,208) from 1955 to 1995 was 99,000 acre-feet (Table 2-8 and Figures 2-2, 2-3).

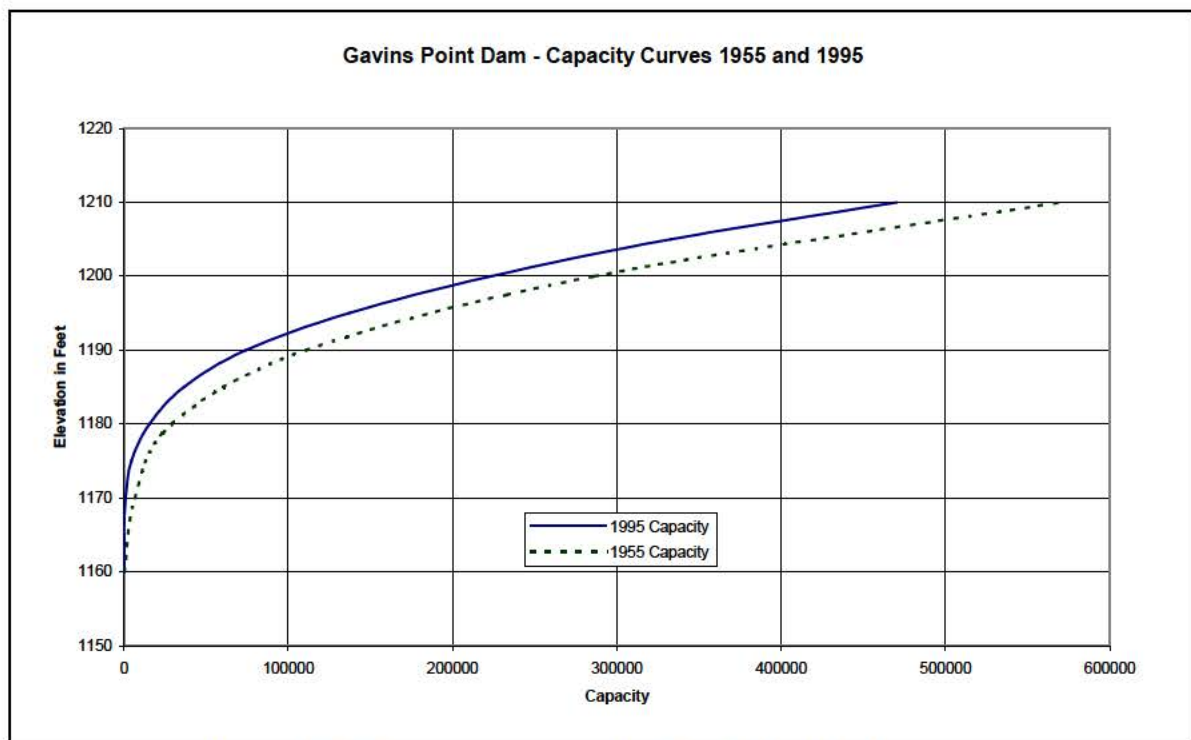
Sedimentation is an influential factor in water-oriented recreation planning. Some public recreation areas have excessive operation and maintenance costs, and the sedimentation process limits their useful life. The major sedimentation processes occurring in Lewis and Clark Lake are

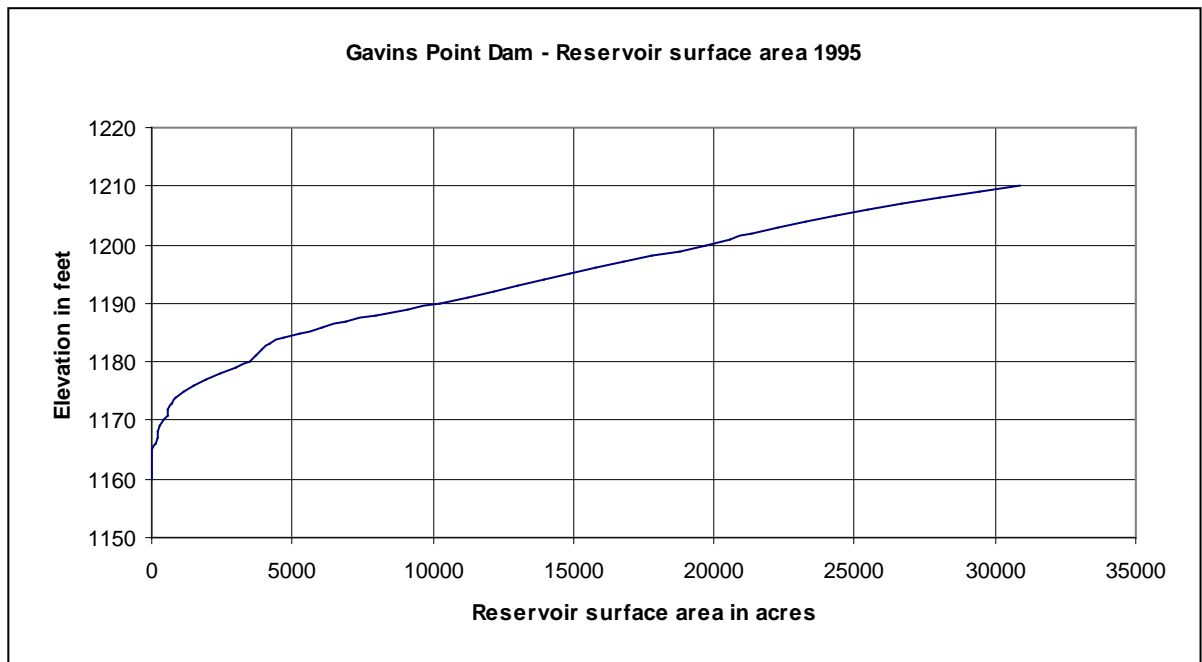
shoreline erosion, littoral drift, delta encroachment, and other sediment deposition. These processes present hazards to boaters, impair/change fisheries, create marshy areas, and jeopardize recreation facilities and infrastructure.

**Table 2-8. Sediment Depletion at Top of Multiple Use Pool - Elevation 1,208 m.s.l.**

| Date of Survey | Capacity<br>(acre-feet) | Capacity Lost<br>Since Closure<br>(acre-feet) | Storage Loss Since Closure |                    |
|----------------|-------------------------|---|----------------------------|--------------------|
|                |                         |   | Total Loss<br>(%)          | Annual Loss<br>(%) |
| 1955           | 510,000                 | N/A <sup>1</sup>                              | N/A                        | N/A                |
| 1960           | 496,000                 | 14,000  | 2.7                        | 0.55               |
| 1965           | 473,000                 | 37,000  | 7.3                        | 0.73               |
| 1970           | 460,000                 | 50,000  | 9.8                        | 0.65               |
| 1975           | 455,000                 | 55,000  | 10.8                       | 0.54               |
| 1979           | 443,000                 | 67,000  | 13.1                       | 0.55               |
| 1985           | 432,000                 | 68,000  | 15.3                       | 0.51               |
| 1995           | 411,000                 | 99,000  | 19.4                       | 0.49               |

<sup>1</sup> N/A = Not applicable





**Figure 2-3. Reservoir Surface Area, Lewis and Clark Lake**

### **2.5.1. Sources of Sediment**

The primary sources of sediment into the Gavins Point Project are through tributary inflow and shoreline erosion.

*Tributary inflow above Springfield/Santee.* More than half of the tributary inflow sediment originates on the Niobrara River. Other sources of sediment originate on the Missouri River below Fort Randall Dam, Ponca Creek, Bazile Creek, and other smaller tributaries and drainage ditches. This sediment, which is mostly sand with some silt, has been depositing from close to the mouth of the Niobrara River and downstream along the Missouri River and into Lewis and Clark Lake.

*Shoreline erosion and tributary inflow from shoreline streams.* About 10 percent of the sediment originates from these sources. The banks along the lake are predominantly high, steep shale and/or chalk bluffs. Shale is a fine-grained rock formed by the hardening of clay, which splits into thin layers when broken. Wave action undercuts the base of the bluffs and the upper portion falls into the water. This is a slow process; however, some local areas have erosion encroaching on or surpassing the government boundary. The banks in the low-lying areas consist of silty loam. On the left bank of the lake from Bon Homme Hutterite Colony upstream to Snatch Creek the banks



are about 25 feet high. The low bank erosion rate in most areas has been slow due to the shallow offshore depths.

### **2.5.2. Locations and Effects of Sediment Deposition**

Deposition is occurring in all sections of the reservoir. However, most of the deposition occurs from the confluence of the Missouri and Niobrara Rivers down to the Springfield/Santee area (the delta foreset is continuing to move downstream toward the dam).

#### Confluence of the Niobrara and Missouri Rivers

The Niobrara River has a relatively steep slope and high concentration of sediment, depositing a portion of its load at and near the confluence with the slower Missouri River. As time has passed, the delta has grown northward by over 2,000 feet. This in turn has caused a backwater effect upstream of the confluence on both the Niobrara and Missouri Rivers, which causes some deposition to occur farther upstream.

The effects of this deposition are many: 1) reduction in the channel capacity, 2) higher water surface elevation for a specific discharge, 3) more frequent flooding, 4) higher groundwater elevation, 5) reduction of farmable land, 6) loss of cottonwood trees, 7) change of vegetation near the river, 8) change in fish habitat (better for some species, worse for others), 9) increase in waterfowl habitat, and 10) damage/changes to infrastructure.

#### Delta Area Near Springfield/Santee

Virtually all of the sediment moving in the Missouri River that has not deposited before entering Lewis and Clark Lake will deposit in the reservoir. As the Missouri River enters the reservoir, velocity slows and the river's sediment load drops out to form a delta. The upper third of the lake is experiencing major sediment deposition as the delta continues to grow.

The area downstream of the delta will undergo systematic changes. The area will start with relatively deep water, then turn to shallow water and then become mostly covered with sandbars. Next, the sandbars will become vegetated and lastly small channels will snake their way through

cattails and small islands. Although the two main channels through the delta have remained fairly stable to this point there is no guarantee that they will remain so.

The effects of this deposition are many: 1) reduction in the lake capacity, 2) higher water surface elevation in the upper delta and upstream, 3) more frequent flooding upstream of delta, 4) higher groundwater elevation, 5) reduction of farmable land upstream of delta, 6) loss of cottonwood trees, 7) change in fish habitat (better for some species, worse for others), 8) damage/changes to infrastructure, 9) swampy conditions that are conducive to mosquito breeding, but very beneficial to migratory waterfowl, and 10) change in channels results in difficult boating.

The formation and development of the delta in Gavins Point reservoir was predicted prior to dam construction and this information was submitted to the public for review and comment. The COE's monitoring and data collection program reveals that it has evolved as forecasted.

#### Shoreline Sedimentation

On Lewis and Clark Lake many public recreation areas have been located on small tributary inlets. These locations were selected because they provide boat harbors that are both easily accessible and protected from reservoir wave action. Unfortunately, the streams that form these inlets carry a sediment load, and over the years this sediment can hamper boating activity.

Littoral drift moves sediment along the shore and causes two problems that can severely hamper boating activity. First, the sediment being transported along the shore forms a littoral drift bar across the mouths of the inlets. This allows the boaters to get their boat into the water, but they may have a difficult time getting to the main reservoir. Second, littoral drift deposits sediment on boat ramps that are located outside of bays.

### **2.5.3. Shoreline Erosion**

Shoreline erosion by reservoir wave action is a consideration in locating recreation development. Unprotected banks under attack by waves will cave into the reservoir. If the eroded material is not carried away by littoral transport, it can form a beach at the base of the bluff. Given enough time

and material, these natural beaches can develop so that incoming wave energy will be dissipated on them and shoreline erosion will be curtailed.

In certain areas shoreline erosion will continue unabated unless special protection is provided. Special protection may be needed to preserve developed facilities in recreation areas, but it is not economically feasible along the general shoreline areas. Shoreline erosion has resulted in a reduction in the width of high bank project lands at some locations; for example, the area adjacent to the Kohles Acres cabin development. Erosion at this area would have impacted property without protection measures completed in the mid-1990s. Future development must consider the anticipated limits of shoreline erosion.

Virtually all of the sediment derived from reservoir shoreline erosion and reservoir tributaries will deposit in the lake.

#### **2.5.4. Sedimentation Summary**

Sedimentation is now and will continue to be a major problem at Lewis and Clark Lake. As the lake ages, sediment will continue to be deposited. As this occurs, the size of the multipurpose pool will decrease and with it the lake's storage capacity and recreational value. The results of sediment buildup, from a recreation standpoint, will be the eventual closure of boat ramps because of poor or no access to the lake. Most of the recreation areas have been affected to a certain extent, and those above the Sand Creek Area have been affected extensively.

The accumulation of sediment is a natural, predicted occurrence and although Federal, State, and local personnel have looked at the sediment issues no plan is in place to move, redirect, or remove the incoming sediment from the reservoir. Many plans have been looked at and discarded as impractical or too costly. Some form of the following ideas seem to be the most practical although all will be expensive and may prove to be impractical with further study:

- a) No action – Lake boating will eventually cease. Most recreation revenues will be lost. River boating will be difficult. Mother nature will fill up the lake, however she wants, within the laws of physics.
- b) Redirecting sediment – As the reservoir fills up with sediment the sediment is redirected to allow the building of numerous lakes, varying in size and purposes.

Sediment will reach the dam slightly sooner than expected due to the capacity of the numerous smaller lakes that was reserved for sediment. Planning will save many old recreation revenues and may add some new ones.

- c) Moving sediment to build large island – Reservoir varies in width but if two river channels existed, one along the Nebraska side and one along the South Dakota side, an island with a width of approximately 7,000 to 8,000 feet could be built. Sediment could be piled tens or even hundreds of feet high. This would slow the filling of the lake, but eventually the lake would fill up.
- d) Reconstruction of dam and river power – This would entail construction of an opening near the bottom of the dam, emptying the water out of the reservoir, and flushing sediment through the dam. This may or may not be physically possible due to the relatively large grain sediment and gentle riverbed slope.
- e) Remove sediment via pipeline – A sediment slurry would be put in a pipe near the delta area and expelled from the pipe below the Gavins Point Dam. So far this solution has both a very high initial and annual cost.

For more details on sediment monitoring and management activities refer to the Omaha District Annual Sedimentation Program Report.

## **2.6. SURFACE WATER QUALITY**

In 1972, Congress enacted the first comprehensive national clean water legislation in response to growing public concern for serious and widespread water pollution. The Clean Water Act is the primary Federal law that protects our nation's waters, including lakes, rivers, wetlands, aquifers, and coastal areas. The Clean Water Act's primary objective is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental national goals: 1) eliminate the discharge of pollutants into the nation's waters, and 2) achieve water quality levels that are fishable and swimmable. The Clean Water Act focuses on improving the quality of the nation's waters. It provides a comprehensive framework of standards, technical tools, and financial assistance to address the many causes of pollution and poor water quality, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction.

Among other things, the Clean Water Act charges the states and tribes to establish water quality standards that appropriately protect waters within their jurisdiction. Executive Order 12088, Federal Compliance With Pollution Control Standards, dated 13 October 1978, requires compliance by Federal facilities and activities with applicable pollution control standards in the same manner as any non-Federal entity. To ensure project compliance, the Federal Facilities Compliance Act of 1990 provides for EPA and/or states to inspect Federally owned or Federally operated facilities that are subject to the Clean Water Act.

### **2.6.1. Beneficial Uses Designated by Nebraska for Water Quality Maintenance**

#### Lewis and Clark Lake

Water quality standards for the State of Nebraska (NDEQ 2000) designate the following beneficial uses for protection on Lewis and Clark Lake: 1) Primary Contact Recreation, 2) Aquatic Life – Warmwater Class A, 3) Public Drinking Water, 4) Agricultural Water Supply – Class A, 5) Industrial Water Supply, and 6) Aesthetics. Primary Contact Recreation includes activities where the body may come into prolonged or intimate contact with the water, such that water may be accidentally ingested and sensitive body organs (e.g., eyes, ears, nose, etc.) may be exposed. These waters may be used for swimming, water skiing, canoeing, and similar activities. Warmwater Class A Aquatic Life includes waters that provide, or could provide, a habitat suitable for maintaining one or more identified key species on a year-round basis. These waters are also capable of maintaining year-round populations of a variety of other warmwater fish and associated vertebrate and invertebrate organisms and plants. Public Drinking Water includes surface waters that serve as a public drinking water supply. After treatment, these waters are suitable for drinking water, food processing, and similar uses. Class A Agricultural Water Supply includes waters that are protected for general agricultural purposes (e.g., irrigation and livestock watering) without treatment. Industrial Water Supply includes waters used for commercial or industrial purposes such as cooling water, hydroelectric power generation, or nonfood processing water, with or without treatment. Aesthetics applies to all surface waters of the State. To be aesthetically acceptable, surface waters are to be free from human-induced pollution that causes noxious odors; floating, suspended, colloidal, or settable materials that produce objectionable films, colors, turbidity, or deposits; and the occurrence of undesirable or nuisance aquatic life (e.g., algal blooms). Narrative and numeric water quality criteria are contained in Nebraska's water quality standards to protect and maintain the designated uses for Lewis and Clark Lake.

### Missouri River (Including Tailwaters) Downstream of Gavins Point Dam

Nebraska's water quality standards designate the following beneficial uses for protection in the Missouri River immediately below Gavins Point Dam: 1) State Resource Water – Class A, 2) Primary Contact Recreation, 3) Aquatic Life – Warmwater Class A, 4) Public Drinking Water, 5) Agricultural Water Supply – Class A, and 6) Aesthetics. Class A State Resource Waters include surface waters which constitute an outstanding state or national resource, such as waters within national or state parks, national forests or wildlife refuges, and waters of exceptional recreational or ecological significance. Waters that provide a unique habitat for Federally designated endangered or threatened species and rivers designated under the Wild and Scenic Rivers Act are also included. The existing quality of these surface waters shall be maintained and protected. Narrative and numeric water quality criteria are contained in Nebraska's water quality standards to protect and maintain the beneficial uses designated for the Missouri River immediately below Gavins Point Dam.

### **2.6.2. Beneficial Uses Designated by South Dakota for Water Quality Maintenance**

#### Lewis and Clark Lake and the Missouri River Downstream of Gavins Point Dam

Water quality standards for the State of South Dakota (SDDENR 2000) designate the following beneficial uses for protection of Lewis and Clark Lake and the Missouri River downstream of Gavins Point Dam: 1) Domestic Water Supply; 2) Warmwater Permanent Fish Life Propagation; 3) Immersion Recreation; 4) Limited Contact Recreation; 5) Fish and Wildlife Propagation, Recreation, and Stock Watering; and 6) Commerce and Industry. Domestic Water Supply includes waters that are suitable for human consumption, culinary or food processing purposes, and other household purposes after suitable conventional treatment. Warmwater Permanent Fish Life Propagation is assigned to surface waters that support aquatic life and are suitable for the permanent propagation or maintenance, or both, of warmwater fish. Immersion Recreation refers to a recreational use where the human body may come in direct contact with the water, to the point of complete submersion and where water may be accidentally ingested or where certain sensitive organs such as the eyes, ears, and nose may be exposed to water. Limited Contact Recreation includes surface waters that are suitable for boating, fishing, and other water-related recreation other than immersion recreation where a person's water contact would be limited to the extent that infections of eyes, ears, respiratory or digestive systems, or urogenital areas would normally be avoided. Fish and Wildlife Propagation, Recreation, and Stock Watering is a

beneficial use classification assigned to all surface waters of South Dakota that may support recreation in and on the water and fish and aquatic life, when sufficient quantities of water are present for sufficient duration to support those uses; provide habitat for aquatic and semi-aquatic wild animals and fowl; provide natural food chain maintenance; and are of suitable quality for watering domestic and wild animals. Commerce and Industry is a use assigned to surface waters that are suitable for use as cooling water, industrial process water, navigation, and production of hydropower. Narrative and numeric water quality criteria are contained in South Dakota's water quality standards to protect and maintain the beneficial uses designated for Lewis and Clark Lake and the Missouri River downstream of Gavins Point Dam.

### **2.6.3. Water Quality and the Wild and Scenic Rivers Act**

The approximately 57-mile reach of the Missouri River from about one mile below Gavins Point Dam to Ponca State Park, Nebraska has been classified as a recreational river under the Federal Wild and Scenic Rivers Act. All of the rivers in the Wild and Scenic System must be free-flowing and the adjacent land must possess outstanding remarkable characteristics for at least one of the following reasons: scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. This reach of the Missouri River was protected as a recreational river because of its outstanding remarkable recreational, fish and wildlife, aesthetic, historical, and cultural values. The Secretary of the U.S. Department of the Interior is mandated to administer the river in a manner that will protect and enhance these values for the benefit and enjoyment of present and future generations. Therefore, the recreational, fish and wildlife, aesthetic, historical, and cultural values that qualified the segment for designation are to be protected and enhanced. Protecting water quality in this reach of the Missouri River is paramount to maintaining and enhancing the remarkable recreational, fish and wildlife, and aesthetic values that enabled this reach of the Missouri River to be classified a recreational river. To this end, the State of Nebraska has designated this reach of the Missouri River as a Class A State Resource Water which infers Tier 3 protection under its water quality standards and the Federal Clean Water Act's antidegradation provisions.

The Federal Clean Water Act requires water quality to be maintained and protected in Tier 3 waters. The U.S. Environmental Protection Agency (EPA) has interpreted this provision to mean no new or increased discharges to Tier 3 waters and no new or increased discharges to tributaries of Tier 3 waters that would result in lower water quality in the Tier 3 waterbody. The only exception to this prohibition, as discussed in the preamble to the Water Quality Standards Regulation (48 F.R. 51402), permits states to allow some limited activities that result in

temporary and short-term changes in the water quality of Tier 3 waters. Such activities must not permanently degrade water quality or result in water quality lower than that necessary to protect the existing uses in the Tier 3 waterbody. The intent of EPA's provision is to limit water quality degradation to the shortest time possible (USEPA 1994).

#### **2.6.4. Water Quality and Endangered Species Act and Biological Opinion Provisions**

In early 2000 the Corps requested that formal Section 7 consultation under the Federal Endangered Species Act begin with the USFWS on Corps projects affecting the Missouri River. An ecosystem-based consultation was conducted that addressed three listed bird species – bald eagle (threatened), Interior population of the least tern (endangered), and Northern Great Plains population of the piping plover (threatened); and one fish species – pallid sturgeon (endangered). A Biological Opinion (BiOp) regarding the four evaluated species was issued concerning the continuing operation and maintenance of the following Missouri River Basin Corps projects:

- Missouri River Main Stem Reservoir System,
- Kansas River Tributary Reservoir System, and
- Maintenance of the Missouri River Bank Stabilization and Navigation Project.

The BiOp stated that the continuing operation of these projects is likely to jeopardize the continued existence of the least tern, piping plover, and pallid sturgeon, but is not likely to jeopardize the continued existence of the bald eagle.

Of the three species identified to be in jeopardy, water quality conditions have the most direct impact on the pallid sturgeon. Pallid sturgeon historically occupied warm, turbid river systems. Current research indicates that pallid sturgeon spawning is directly linked to water temperature – as water temperature increases to 16.7° to 18.3°C (62° to 65°F) pallid sturgeon initiate spawning activity (USFWS 2000). Current operation of the Fort Peck, Garrison, and Fort Randall Dams with hypolimnetic hydropower releases provides unsuitable colder water temperatures that negatively impact spawning by native river fishes, including the pallid sturgeon, and production at all trophic levels (USFWS 2000). More suitable water temperatures for native fish spawning and invertebrate production exist in the free-flowing river below Gavins Point Dam. Pallid sturgeon avoid areas without turbidity and current (Bailey and Cross 1954, Erickson 1992).



Turbidity levels below all of the Missouri River main stem reservoirs have been significantly reduced from pre-impoundment conditions due to sediment trapping in the impounded reservoirs. Due to the long potential life span of pallid sturgeon (i.e., greater than 50 years), the fish is particularly susceptible to the bioaccumulation of pollutants that may contribute to early mortality and reduced reproductive viability. The BiOp stated the Corps was to consider the Missouri River reach from Gavins Point Dam to the Mississippi River as a high priority segment for pallid sturgeon management efforts (USFWS 2000). The reach from Gavins Point Dam to the Mississippi River was also one of four recovery priority management areas on the Missouri River identified by the Pallid Sturgeon Recovery Plan (USFWS 1993) for priority implementation of recovery actions.

The BiOp stated that the Corps should adopt adaptive management as one tool to preclude jeopardy to least terns, piping plovers, and pallid sturgeon. The BiOp requested that the Corps: 1) evaluate the cumulative effects of bank stabilization, as permitted by the Corps, to determine to what extent continued stabilization is reducing sedimentation, turbidity, import of organic matter, and elimination of cut-bank habitat on the Missouri River; 2) evaluate the capability and practicality of increasing water temperature of the Missouri River in priority reaches during critical periods for native warmwater fish through adjustment of water discharge requirements for power plants and other industries; 3) research and develop a way to restore the dynamic equilibrium of sediment transport and associated turbidity in river reaches downstream of Fort Peck, Garrison, Fort Randall, and Gavins Point Dams; and 4) restore turbidity to functional levels downstream of Fort Peck, Fort Randall, and Gavins Point Dams.

#### **2.6.5. Surface Water Quality Monitoring**

The Corps has collected water quality data at the Gavins Point project since the mid-1970s. Water quality data collection has varied through this period, but has generally consisted of monitoring ambient water quality conditions at: 1) a deepwater site in Lewis and Clark Lake near the dam; 2) in the Missouri River downstream of the dam in the tailwaters; 3) tributary inflows to Lewis and Clark Lake; 4) within the penstock in the Gavins Point powerhouse; and 5) a deepwater site in Lake Yankton (i.e., the old Missouri River channel that was cut off between the dam and tailwaters training dike). Other agencies, including the U.S. Geological Survey, Nebraska Department of Environmental Quality, and the South Dakota Department of Environment and Natural Resources, have collected water quality data at the Gavins Point project.

Recent water quality data collection by the Corps at the Gavins Point project has consisted of ambient monitoring at the deepwater sites in Lewis and Clark Lake and Lake Yankton, at the Missouri River tailwaters site below the dam, and within the penstock in the powerhouse. Monitoring at the Lewis and Clark and Lake Yankton deepwater sites has generally been on a monthly basis from May through October, with some winter sampling. Profile measurements for water temperature, dissolved oxygen, pH, and conductivity were taken, water clarity was measured, and a composite sample was collected for laboratory analysis. Composite sampling was discontinued in 2002, when collection of a separate near-surface and near-bottom sample was initiated. Monitoring at the tailwaters site has consisted of a near-shore grab sample collected generally on a monthly basis from May through October. Monitoring at the powerhouse has been on a continuous basis for water temperature, dissolved oxygen, pH, and conductivity. Laboratory analyses have varied, but have usually included general chemistry, nutrients, solids, metals, pesticides, and chlorophyll. Water quality sampling in 2002 also consisted of the weekly collection of bacteria samples at designated swimming beaches on Lewis and Clark Lake (i.e., Weigand, Gavins Point, Midway West, Midway East, and Catamaran Area) and Lake Yankton (i.e., Training Dike).

Beginning in late 2002, a new comprehensive water quality monitoring program is targeted for implementation by the Omaha District on the Missouri River main stem reservoir projects. See Section 2.6, entitled Future Actions – Monitoring Water Quality at the Gavins Point Project, for a description of the proposed water quality monitoring program.

#### **2.6.6. Existing Surface Water Quality Conditions**

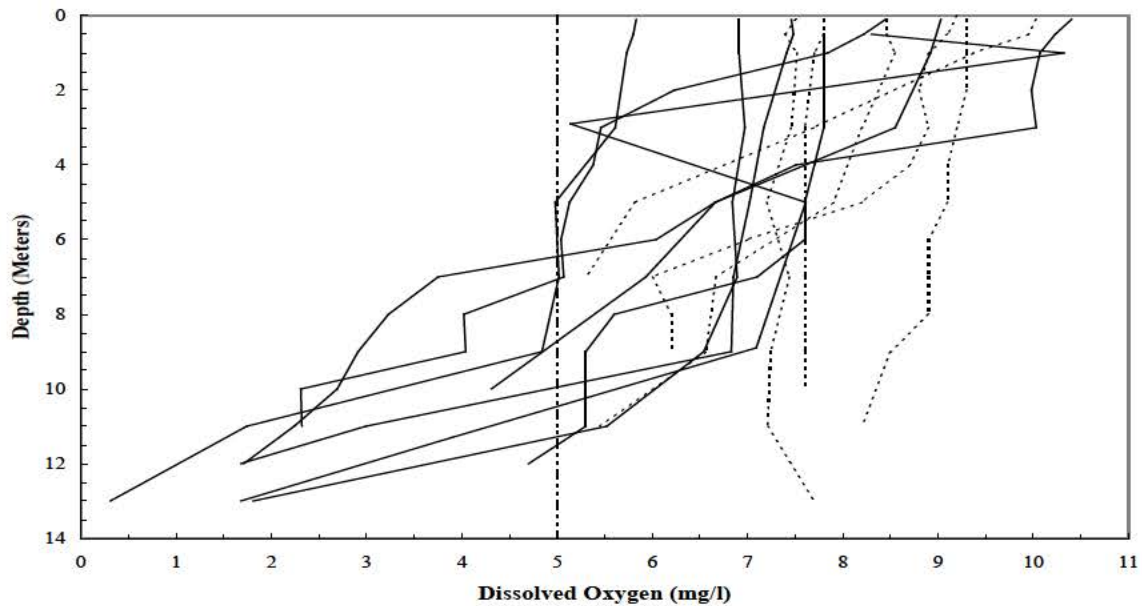
Existing surface water quality conditions were determined from monitoring results obtained during the past seven years (i.e., 1995 to 2001).

##### Temperature and Dissolved Oxygen Profiles

A significant water quality concern that can occur in reservoirs that thermally stratify in the summer is the depletion of dissolved oxygen levels in the hypolimnion. This is a natural process attributed to the differing density of water with temperature and the utilization of in-lake dissolved oxygen in the decomposition of organic matter and the oxidation of reduced substances. When density differences become significant, the deeper cooler water becomes stagnant because it is isolated from the surface and reoxygenation from the atmosphere. The deeper stagnant water can become anoxic and can result in the release of sediment bound substances (e.g., phosphorus,

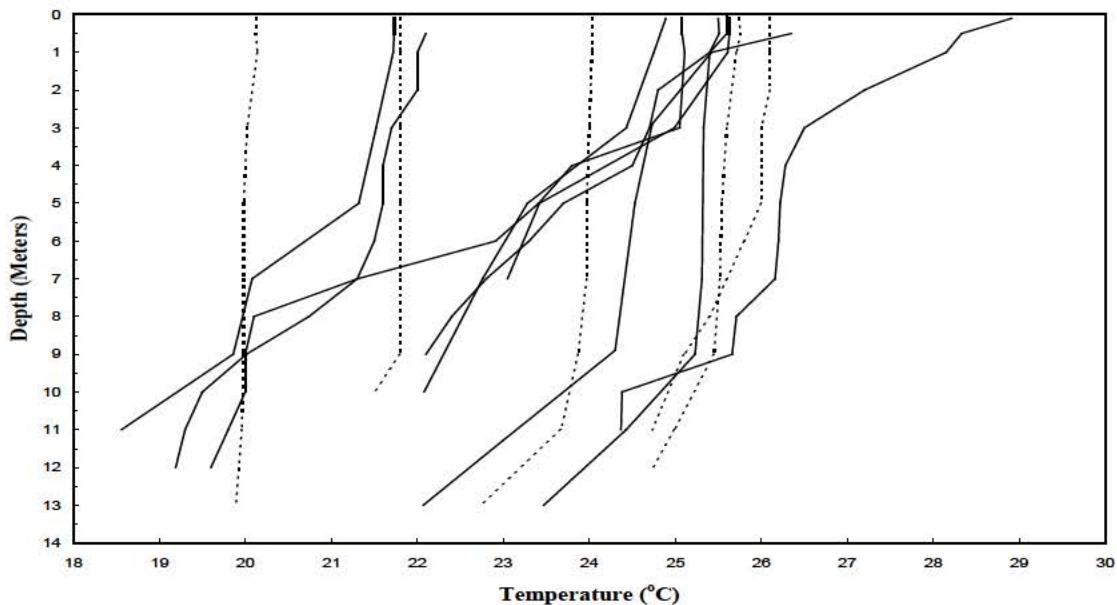
metals, sulfides, etc.) as the oxidation-reduction potential decreases (i.e., becomes more negative). Anoxic conditions can also result in the production of toxic and caustic substances. These conditions can impact aquatic life in the lake and also in waters downstream of the reservoir if dam releases from the reservoir are from a bottom outlet such as at Gavins Point Dam. Nebraska and South Dakota water quality standards define a minimum level of 5 mg/l dissolved oxygen for the protection of aquatic life during the summer months.

To evaluate thermal stratification and hypolimnetic oxygen depletion in Lewis and Clark Lake, temperature and dissolved oxygen depth profiles were constructed from summer measurements taken at the near dam deepwater site during the period 1995 through 2001 (Figures 2-4 and 2-5). Figure 2-4 shows that, in most cases, a sharp thermocline was not established in Lewis and Clark Lake; however, there does appear to be some thermal stratification present at times during the summer. Figure 2-5 indicates that the thermal stratification present in Lewis and Clark Lake is significant enough to affect dissolved oxygen levels. On several occasions during the period 1995 to 2001 dissolved oxygen levels were below 5 mg/l at the lower depths, and were below 2 mg/l on a few occasions. This may indicate the potential for the problems associated with an anoxic environment. It is noted (personal communication) that pumps at the Gavins Point powerhouse have experienced corrosion problems. This could be an indication that hydrogen sulfide, which is highly corrosive, is being formed in the hypolimnion during the summer when dissolved oxygen becomes depleted.



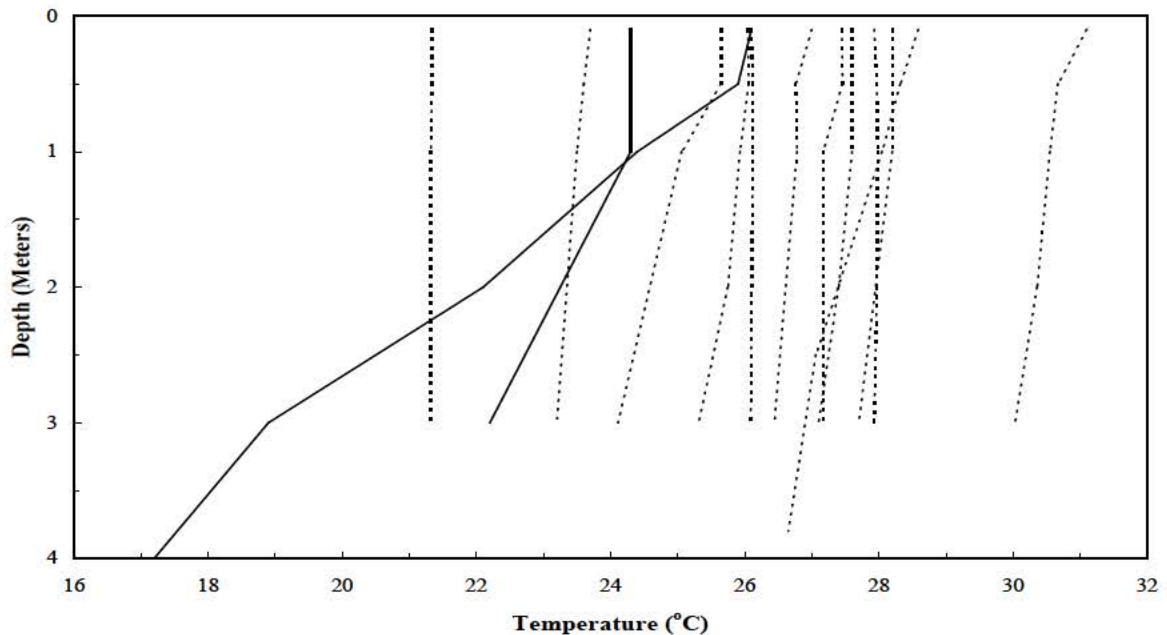
**Figure 2-4. Temperature Depth Profiles, Lewis and Clark Lake, 1995-2001**

Temperature depth profiles constructed from summer measurements taken at the deepwater site on Lewis and Clark Lake during the period 1995-2001. Solid lines denote profiles where some thermal stratification is present.



**Figure 2-5. DO Depth Profiles, Lewis and Clark Lake, 1995-2001**

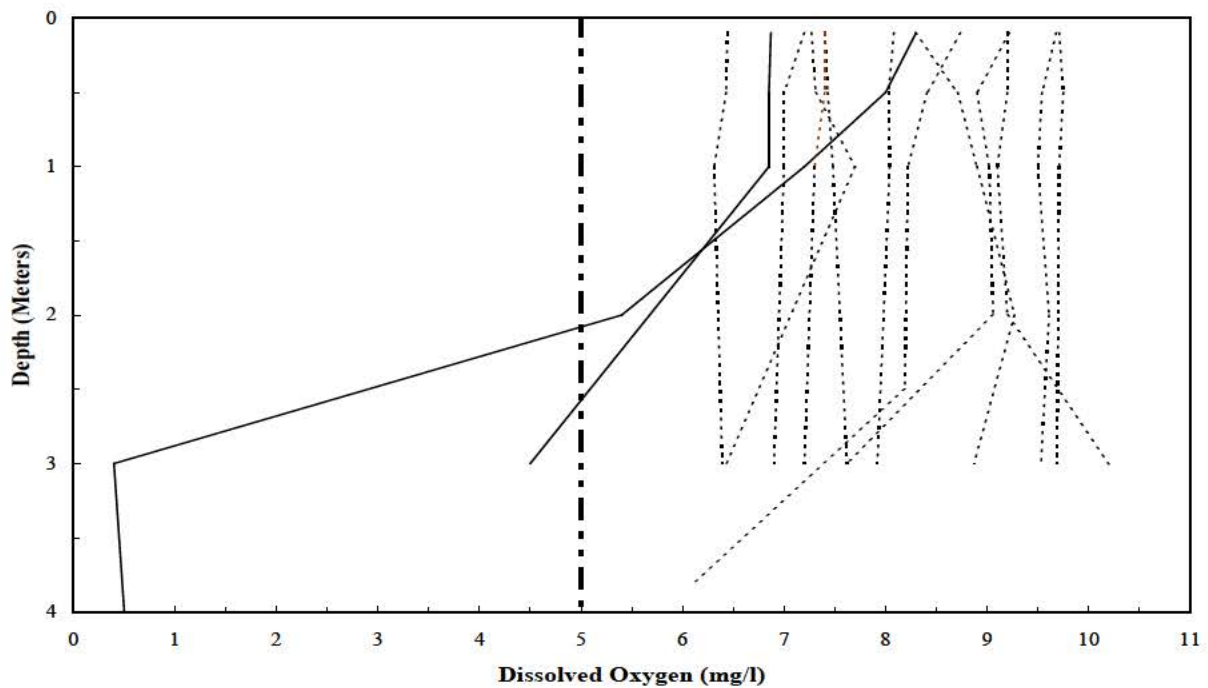
Dissolved oxygen depth profiles constructed from summer measurements taken at the deepwater site on Lewis and Clark Lake during the period 1995-2001. Solid lines denote profiles where dissolved oxygen levels go below 5 mg/l.



**Figure 2-6. Temperature Depth Profiles, Lake Yankton, 1995-2001**

Temperature depth profiles constructed from summer measurements taken at the deepwater site on Lake Yankton during the period 1995-2001. Solid lines denote profiles where some thermal stratification is present.

To evaluate thermal stratification and hypolimnetic oxygen depletion in Lake Yankton, temperature and dissolved oxygen depth profiles were constructed from summer measurements taken at the deepwater site during the period 1995 through 2001 (Figures 2-6 and 2-7). In only one case was a sharp thermocline determined to be present (Figure 2-6). Only two dissolved oxygen profiles exhibited levels below 5 mg/l (Figure 2-7). The one case where the dissolved oxygen levels indicated anoxic conditions was when there was a sharp thermocline present (i.e., July 28, 2000). The shallow nature of Lake Yankton (maximum depth less than four meters) apparently allows for complete mixing by wind action in most situations.



**Figure 2-7. DO Depth Profiles, Lake Yankton, 1995-2001**

Dissolved oxygen depth profiles constructed from summer measurements taken at the deepwater site on Lake Yankton during the period 1995-2001. Solid lines denote profiles where dissolved oxygen levels go below 5 mg/l.

### Trophic Status

Existing water quality conditions were evaluated using a trophic state index (TSI) as described by Carlson (1977). TSI values are determined from Secchi depth transparency, total phosphorus, and chlorophyll a measurements. Values for these three parameters are converted to an index number ranging from 0 to 100 according to the following equations:

$$TSI(SD) = 10 [6 - (\ln SD / \ln 2)],$$

$$TSI(Chl) = 10 [6 - ((2.04 - 0.68 \ln Chl) / \ln 2)],$$

$$TSI(TP) = 10 [6 - (\ln (48/TP) / \ln 2)].$$

The States of Nebraska and South Dakota combine these three values to obtain an average TSI value [i.e., TSI(Avg)] and interpret the average value as follows:

**Table 2-9. Nebraska and South Dakota TSI Interpretations**

| Nebraska        |                   | South Dakota    |                      |                 |
|-----------------|-------------------|-----------------|----------------------|-----------------|
| <u>TSI(Avg)</u> | Trophic Condition | <u>TSI(Avg)</u> | Trophic Condition    | Use Support     |
| 0-40            | Oligotrophic      | 0-35            | Oligotrophic         | Full Support    |
| 41-50           | Mesotrophic       | 36-50           | Mesotrophic          | Full Support    |
| 51-70           | Eutrophic         | 51-55           | Moderately Eutrophic | Full Support    |
| >70             | Hypereutrophic    | 56-65           | Eutrophic            | Partial Support |
|                 |                   | 66-100          | Hypereutrophic       | Not Supporting  |

TSI values were calculated based on the data collected by the Corps. TSI values are to be calculated on measurements taken in the photic zone during the “growing season” (i.e., May to September). It is noted that total phosphorus and chlorophyll a values were determined from a composite sample collected from the surface to bottom. This most likely introduces a low bias to the measured chlorophyll a values, and an unknown bias to the measured total phosphorus values. The Secchi depth transparency readings were taken in the photic zone and should be unbiased. Table 2-10 summarizes the TSI values determined for Lewis and Clark Lake and Lake Yankton from growing season measurements for the period 1995 to 2001.

**Table 2-10. Statistical Summary of TSI Values, Lewis and Clark Lake and Lake Yankton, 1995-2001**

| Lake                 | Statistic | TSI(SD) | TSI(Chl) | TSI(TP) | TSI(Avg) |
|----------------------|-----------|---------|----------|---------|----------|
| Lewis and Clark Lake | Minimum   | 50      | 40       | 37      | 47       |
|                      | Median    | 62      | 45       | 62      | 63       |
|                      | Mean      | 62      | 48       | 62      | 62       |
|                      | Maximum   | 70      | 65       | 84      | 73       |
| Lake Yankton         | Minimum   | 41      | 40       | 37      | 46       |
|                      | Median    | 56      | 40       | 57      | 55       |
|                      | Mean      | 55      | 46       | 60      | 56       |
|                      | Maximum   | 67      | 67       | 83      | 67       |

The mean and median TSI(Avg) values indicate that Lewis and Clark Lake is eutrophic and according to South Dakota criteria, only partially supporting its beneficial use. The mean and median TSI(Avg) values indicate that Lake Yankton is eutrophic and supportive of its beneficial uses.

## 2.6.7. Statistical Summary of Miscellaneous Water Quality Parameters

Table 2-11 provides a statistical summary of miscellaneous water quality parameters monitored from 1999 to 2001 at the Lewis and Clark Lake deepwater site and the Missouri River tailwaters site. The water quality samples collected at the Lewis and Clark deepwater site consist of a composite sample taken from the surface to near the bottom, with the exception that the pH and conductivity measurements represent near-surface conditions. The water quality samples collected at the tailwaters site consist of near-surface grab samples. In reviewing Table 2-11 it can be seen that the water quality conditions sampled in Lewis and Clark Lake are very similar to the conditions sampled in the tailwaters with the exception of total suspended solids, turbidity, iron, manganese, and zinc. The maximum values for these parameters are significantly higher at the tailwaters site. However, this is believed to have been an isolated occurrence as the median values for these parameters at both sites are quite similar. The exceptionally high iron and high manganese values may be an indication of anoxic conditions in the bottom waters of Lewis and Clark Lake. These metals tend to be released from bottom sediments under low oxygen conditions, and the outlet works at Gavins Point Dam draws water from near the bottom (i.e., elevation 1,139 m.s.l.).

**Table 2-11. Water Quality Parameters, Lewis and Clark Lake and Missouri River Tailwaters**

| Parameter               | Lewis and Clark Lake |       |        |       |       | Missouri River Tailwaters |       |        |       |       |
|-------------------------|----------------------|-------|--------|-------|-------|---------------------------|-------|--------|-------|-------|
|                         | Obs.                 | Min.  | Median | Mean  | Max.  | Obs.                      | Min.  | Median | Mean  | Max.  |
| Dissolved Oxygen (mg/l) | *                    | *     | *      | *     | *     | 12                        | 5.0   | 8.2    | 7.8   | 9.8   |
| pH (S.U.)               | 14                   | 8.0   | 8.5    | na    | 8.9   | 13                        | 8.0   | 8.4    | na    | 8.7   |
| Conductivity (umhos)    | 10                   | 558   | 781    | 760   | 876   | 8                         | 605   | 794    | 775   | 871   |
| Alkalinity (mg/l)       | 16                   | 153   | 164    | 163   | 175   | 16                        | 152   | 165    | 163   | 175   |
| Dissolved Solids (mg/l) | 16                   | 492   | 637    | 639   | 1,070 | 16                        | 489   | 619    | 640   | 1,130 |
| Total Suspended Solids  | 16                   | 4     | 16     | 15    | 21    | 16                        | 4     | 11     | 25    | 216   |
| Turbidity (NTU)         | 15                   | 5     | 12     | 12    | 20    | 16                        | 4     | 10     | 16    | 107   |
| Total Ammonia (mg/l)    | 16                   | <0.01 | <0.01  | ----- | 0.32  | 16                        | <0.01 | <0.01  | ----- | 0.21  |
| Total Kjeldahl Nitrogen | 16                   | <0.1  | 0.17   | 0.21  | 0.55  | 16                        | <0.1  | 0.28   | 0.30  | 0.90  |

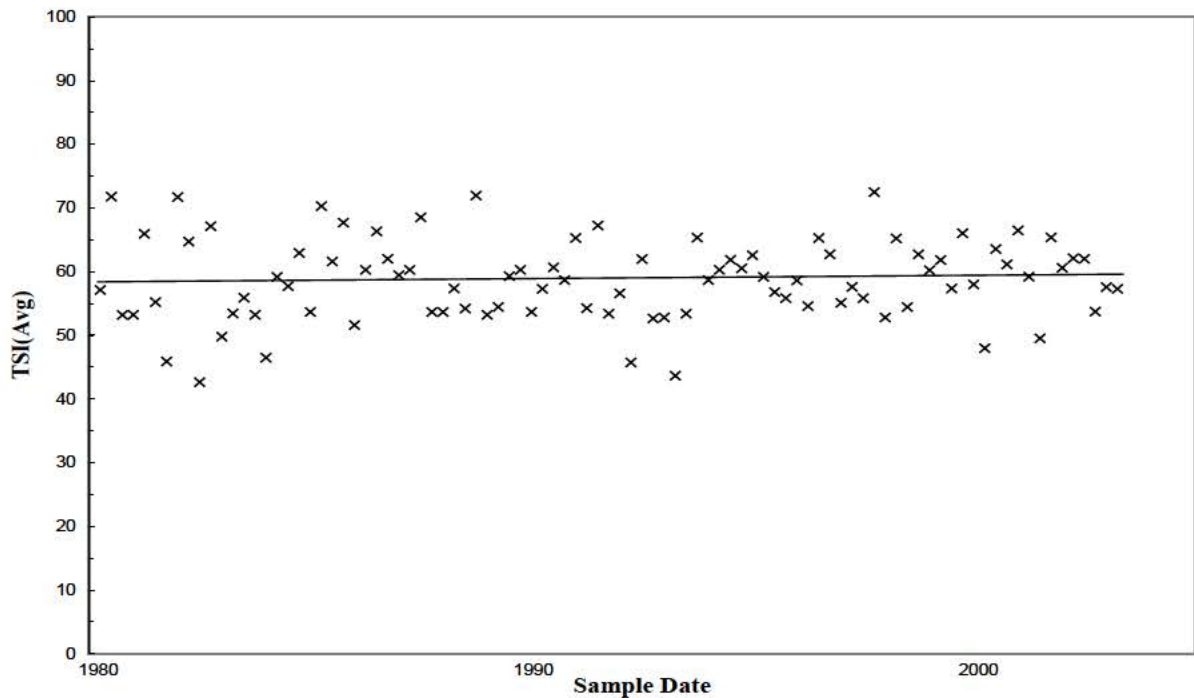


**Table 2-11 (continued). Water Quality Parameters, Lewis and Clark Lake and  
Missouri River Tailwaters**

| Parameter                | Lewis and Clark Lake |       |        |       |      | Missouri River Tailwaters |       |        |       |       |
|--------------------------|----------------------|-------|--------|-------|------|---------------------------|-------|--------|-------|-------|
|                          | Obs.                 | Min.  | Median | Mean  | Max. | Obs.                      | Min.  | Median | Mean  | Max.  |
| Nitrate-Nitrite Nitrogen | 11                   | <0.02 | 0.24   | 0.28  | 0.74 | 12                        | <0.02 | 0.19   | 0.24  | 0.77  |
| Total Phosphorus (mg/l)  | 16                   | 0.02  | 0.05   | 0.06  | 0.13 | 16                        | 0.02  | 0.05   | 0.06  | 0.21  |
| Dissolved Organic Carbon | 12                   | 3.2   | 4.5    | 4.6   | 6.7  | 13                        | 3.0   | 4.3    | 4.5   | 7.0   |
| Hardness (mg/l)          | 16                   | 234   | 256    | 262   | 302  | 16                        | 232   | 261    | 266   | 306   |
| Calcium, Total (mg/l)    | 9                    | 57    | 62     | 64    | 75   | 9                         | 57    | 63     | 66    | 81    |
| Magnesium, Total (mg/l)  | 9                    | 22    | 24     | 24    | 28   | 9                         | 22    | 24     | 24    | 29    |
| Sodium, Total (mg/l)     | 9                    | 44    | 73     | 71    | 83   | 9                         | 42    | 74     | 72    | 83    |
| Potassium, Total (mg/l)  | 9                    | 5     | 7      | 7     | 9    | 9                         | 5     | 7      | 7     | 9     |
| Sulfate, Total (mg/l)    | 9                    | 34    | 221    | 212   | 291  | 9                         | 34    | 224    | 211   | 299   |
| Arsenic, Total (ug/l)    | 9                    | <3    | <3     | ----- | 4    | 9                         | <3    | <3     | ----- | 4     |
| Copper, Total (ug/l)     | 9                    | <2    | <2     | ----- | 7    | 9                         | <2    | <2     | ----- | 72    |
| Iron, Total (ug/l)       | 9                    | 186   | 370    | 352   | 496  | 9                         | 180   | 257    | 902   | 5,292 |
| Lead, Total (ug/l)       | 9                    | <2    | <2     | ----- | <2   | 9                         | <2    | <2     | ----- | 3     |
| Manganese, Total (ug/l)  | 9                    | 29    | 52     | 58    | 169  | 9                         | 24    | 47     | 76    | 314   |
| Zinc, Total (ug/l)       | 9                    | <3    | 5      | 5     | 8    | 9                         | <3    | 4.5    | 11    | 43    |
| Mercury, Total (ug/l)    | 6                    | <0.01 | <0.01  | ----- | 0.02 | 6                         | <0.01 | <0.01  | ----- | 0.02  |

### 2.6.8. Surface Water Quality Trends

Surface water quality trends were assessed by evaluating TSI(Avg) values calculated from monitoring results obtained at the Lewis and Clark Lake deepwater site for the period 1980 to 2001. Figure 2-8 shows a time series plot of TSI(Avg) values at the deepwater site. No detectable trend was discernable.



**Figure 2-8. Average TSI Values, Lewis and Clark Lake, 1980-2001**

TSI(Avg) values calculated from monitoring results obtained at the Lewis and Clark Lake deepwater site for the period 1980 through 2001. The solid line represents a trend line for the data.

### **2.6.9. Surface Water Quality Problems and Concerns**

#### State 303(d) Listings

Lewis and Clark Lake is not listed by the States of Nebraska or South Dakota on their current 303(d) lists. The Missouri River below Gavins Point Dam is not listed on South Dakota's current 303(d) list, but is listed on Nebraska's current 303(d) list. The impaired use identified by Nebraska is Primary Contact Recreation. The pollutant identified is pathogens and the identified probable source is agriculture.

### Fish Consumption Advisories

There are currently no fish consumption advisories issued by Nebraska or South Dakota for Lewis and Clark Lake or for the Missouri River immediately below Gavins Point Dam.

### Contradictory Water Quality Management Goals for the Missouri National Recreational River Reach below Gavins Point Dam

A water quality management concern is the seemingly contradictory water quality management goals identified for the Missouri National Recreational River (MNRR) reach under the Federal Endangered Species Act (ESA), Clean Water Act (CWA), and Wild and Scenic Rivers Act (WSRA). The BiOp, developed pursuant to the ESA, directs the Corps to increase turbidity and suspended solids in the MNRR. The BiOp states that sediment transport and turbidity need to be restored to functional levels in the MNRR reach to improve habitat conditions for the jeopardized species inhabiting the reach. State water quality standards (i.e., South Dakota and Nebraska) adopted pursuant to the CWA require that suspended solids and turbidity levels be maintained at “reduced” levels in the MNRR reach, and imply that increasing turbidity and suspended solids levels in the reach could represent a degradation of water quality conditions and a possible impairment of a designated beneficial use.

South Dakota has specifically adopted water quality standards criteria to manage total suspended solids levels in the MNRR reach. One of the beneficial uses South Dakota designates on the MNRR reach is “warm water permanent fish life propagation.” Protection of this use requires that total suspended solids levels are to be  $\leq 158$  mg/l as a daily maximum, and  $\leq 90$  mg/l as a 30-day average. Management of the MNRR reach as a recreational river under the WSRA requires that the values for which it was designated as a recreational river (i.e., its outstanding remarkable recreational, fish and wildlife, aesthetic, historical, and cultural values) be protected and enhanced.

Increasing suspended solids and turbidity levels in the MNRR reach may degrade the habitat for recreationally important fish species that were present in the reach when it was designated as a recreational river. The existing water quality literature suggests that elevated levels of turbidity adversely impact the recreational and aesthetic values of a water body. The U.S. Environmental Protection Agency’s “Red Book” states “Turbid water interferes with recreational use and aesthetic enjoyment of water” (USEPA 1976). The USFWS should enter consultation with EPA

Regions VII and VIII, and possibly the NPS, to discuss coordinating the water quality aspects of the BiOp, CWA, and WSRA to ensure that there are consistent water quality management goals on the MNRR reach.

### Sedimentation

Sedimentation of Lewis and Clark Lake is discussed in earlier sections of this Master Plan. Compared to 1955 conditions at pool elevation 1,208 m.s.l., Lewis and Clark Lake, as of 1995, experienced a volume loss of 19.4%. This equates to an annual volume loss of 0.49%. The Nebraska Department of Environmental Quality currently uses a 25% loss of the original reservoir “normal” or conservation pool volume as a criterion for listing reservoirs on the State’s 303(d) list for sedimentation problems. Given the conditions in 1995, and assuming a 0.49% annual volume loss, 25% volume loss may be reached in Lewis and Clark Lake around 2006.

### Eutrophication of Lewis and Clark Lake

It appears that Lewis and Clark Lake may be experiencing some eutrophication concerns – specifically, depressed dissolved oxygen levels in summer hypolimnetic waters. TSI values, as applied to South Dakota water quality assessment criteria, indicate that the lake is only partially supporting its beneficial use. These conditions may be attributed to nutrient (i.e., total phosphorus) loadings to the lake.

## **2.7. FUTURE ACTIONS – MONITORING WATER QUALITY AT THE GAVINS POINT PROJECT**

### **2.7.1. Water Quality Monitoring Goals and Objectives**

The “Monitoring Strategy for the Omaha District’s Water Quality Management Program” identifies the goals and objectives for water quality monitoring implemented by the Omaha District. Of the 5 goals and 16 objectives identified in the District’s water quality monitoring strategy, the following are deemed directly applicable to monitoring at the 6 Missouri River mainstem projects, including the Gavins Point Project.

Goal 1: Determine surface water quality conditions at Corps projects.

- 2) Characterize the spatial and temporal distribution of water quality conditions at Corps projects.
- 3) Determine if water quality conditions attributed to the operation of Corps projects are improving, degrading, or staying the same over time.

Goal 2: Determine if any surface water quality concerns exist that are due to the operation of Corps projects.

- 4) Determine if water quality conditions at Corps projects, or attributable to the operation of Corps projects (i.e., downstream conditions resulting from reservoir discharges), meet applicable Federal, State, and local water quality standards.
- 5) Assess water quality conditions at Corps projects in relation to potential sources, transport, fate, and effects of contaminants.
- 6) Evaluate water/sediment interactions and their effects on overall water quality at Corps projects.
- 7) Identify the presence and concentrations of contaminants in indicator and human-consumed fish species at Corps projects.
- 8) Investigate, as necessary, unique events (e.g., fish kills, hazardous waste spills, operational emergencies, health emergencies, public complaints, etc.) at Corps projects that may have degraded water quality or indicate that the aquatic environment has been impacted.
- 9) Identify pollutants and their sources that are affecting water quality and the aquatic environment at Corps projects.

Goal 4: Provide data to support reservoir regulation elements at Corps projects for effective management and enhancement of surface water quality and the aquatic environment.

- 14) Provide water quality data required for real-time regulation of Corps projects.
- 15) Collect the information needed to design, engineer, and implement measures or modifications at Corps projects to enhance surface water quality and the aquatic environment.

Goal 5: Evaluate the effectiveness of structural or operational measures implemented at Corps projects to enhance surface water quality and/or the aquatic environment.

- 16) Evaluate the effectiveness of implemented measures at Corps projects to improve water quality and the aquatic environment.

### **2.7.2. Data Collection Approach**

Of the four data collection approaches identified in the District's water quality monitoring strategy, the following three will be utilized to monitor water quality at the Gavins Point project:

- Long-Term Fixed Station Monitoring,
- Special Studies Monitoring, and
- Investigative Monitoring.

#### Long-Term Fixed Station Monitoring

The primary purpose of long-term fixed station monitoring at the Gavins Point project is to determine water quality trends and temporal variability. Defining water quality trends and temporal variability will directly address monitoring objectives 2, 3, and 4; and facilitate meeting monitoring objectives 9, 15, and 16. Monitoring objective 14, "Provide water quality data required for real-time regulation of Corps projects," could be addressed through a properly located long-term fixed monitoring station; however, at this time no such monitoring need has been identified at the Gavins Point project.

*Deepwater Sites:* A deepwater site will be established in the deeper, downstream end of Lewis and Clark Lake near the dam. This deepwater site is meant to represent pelagic conditions present in the lake in the deepwater area near the dam. A deepwater site will also be established on Lake Yankton. The location of these sites, if appropriate, will be at the same location where previous monitoring has occurred and been identified as a deepwater site.

Water quality grab samples will be collected at two depths at the deepwater sites: near-surface and near-bottom. The near-surface sample will be collected at approximately one-half the

measured Secchi depth, and the near-bottom sample will be collected at approximately 1 meter above the lake bottom. Profile measurements will also be taken from the lake surface to the bottom in 1-meter increments. The deepwater sites are to be monitored monthly from May through September (i.e. five “evenly-spaced” samples). The five samples are to be separated by at least 21 days, but no more than 35 days.

*Powerhouse Site:* A powerhouse water quality-monitoring site will be maintained at Gavins Point dam. Water discharged from Lewis and Clark Lake is primarily through the powerhouse. Water quality monitoring at the powerhouse site will encompass placing monitoring probes in the “penstock” to continuously monitor water temperature, dissolved oxygen, pH, conductivity, and possibly other water quality parameters year-round. Measurements would be taken at an appropriate interval (e.g., hourly) and stored to an appropriate data logger on-site. The data stream provided by this monitoring could be made real-time if the communication network allows and it is deemed warranted.

*Tailwater Site:* A tailwater site will be established downstream of Gavins Point dam in the Missouri River. The tailwater site is meant to represent “completely-mixed” conditions present at the start of the river reach immediately downstream of the dam. The tailwater site will be located mid-channel at an appropriate distance downstream from the dam to allow for mixing of discharges made through the powerhouse, outlet works (if they occur), and initial stabilization of the dam discharge with the atmosphere. A near-surface water quality grab sample will be collected at the tailwater site. The near-surface sample will be collected just below the surface (i.e., approximately 6 inches below the surface). The tailwater site will be monitored monthly year-round. The monthly samples collected at the tailwater site are to be separated by at least 21 days, but no more than 35 days. Collection of monthly samples during the winter may be curtailed or sampling may be from the bank if weather and ice conditions warrant.

### **2.7.3. Parameters to be Measured and Analyzed**

The water quality parameters that are to be monitored at the deepwater and tailwater sites are given in Table 2-12. Profile measurements will include water temperature, pH, conductivity, and dissolved oxygen (mg/l and percent saturation), and possibly ORP (i.e., oxidation-reduction potential). Explanatory variables to be quantified include lake water surface elevation and discharge through the power plant, outlet works, and spillway. Water surface elevation and discharge will be obtained on-site from the project office or after-the-fact from project records.

**Table 2-12. Water Quality Parameters to be Monitored at Lewis and Clark Lake**

| Parameter                         | Deepwater      |                | Tailwater      |
|-----------------------------------|----------------|----------------|----------------|
|                                   | Near Surface   | Near Bottom    |                |
| Total Suspended Solids            | X              | X              | X              |
| Total Kjeldahl Nitrogen           | X              | X              | X              |
| Nitrate/Nitrite Nitrogen          | X              | X              | X              |
| Total Ammonia Nitrogen            |                |                | X              |
| Total Phosphorus                  | X              | X              | X              |
| Dissolved Orthophosphorus         | X              | X              |                |
| Alkalinity                        | X              | X              | X              |
| Chlorophyll                       | X              |                | X              |
| Total Organic Carbon              |                |                | X              |
| Chemical Oxygen Demand            |                |                | X              |
| Chloride                          |                |                | X              |
| Pesticides <sup>1</sup>           | X              | X              | X              |
| Dissolved Metals <sup>2</sup>     | X              | X              | X              |
| Selenium, Total <sup>3</sup>      | X              | X              | X              |
| Water Transparency (Secchi Depth) | X              |                | X              |
| Turbidity                         | X              |                | X              |
| Profile <sup>4</sup>              | X <sup>5</sup> | X <sup>5</sup> | X <sup>6</sup> |

<sup>1</sup> One complete pesticide scan in May or June and "Rapid Assay" for atrazine, alachlor, and metholachlor all months. The complete pesticide scan includes: acetochlor, alachlor, atrazine, benfluralin, butylate, chlorpyrifos, cyanazine, cycloate, EPTC, hexazinone, isopropalin, metolachlor, metribuzin, molinate, oxadiazon, oxyfluorfen, pebulate, pendimethalin, profluralin, prometon, propachlor, propazine, simazine, trifluralin, and vernolate.

<sup>2</sup> Only analyzed for in the month of May or June. Metals to be analyzed: Ag, As, Be, Ca, Cd, Cr, Cu, Hg, Mg, Na, Ni, Pb, Sb, Ti, Zn.

<sup>3</sup> Only analyzed for in the month of May or June.

<sup>4</sup> Profile to include: water temperature, pH, conductivity, dissolved oxygen (mg/l and % saturation), and ORP (oxidation-reduction potential).

<sup>5</sup> 1-meter increments surface to bottom

<sup>6</sup> Near surface only.

### Special Studies Monitoring

The primary purpose of special studies monitoring is to address specific water quality issues at the main stem projects. A special studies effort that will be implemented on a regular basis is the Rotating Mainstem Project Monitoring Program (RMPMP). The RMPMP will intensively monitor water quality at each of the main stem projects on a 5-year cycle. A selected project(s) will be monitored each year with all projects being monitored over a 5-year period. The tentative schedule for the first cycle of RMPMP monitoring is as follows:

- Gavins Point and Fort Randall (2003)



- Big Bend (2004)
- Oahe (2005)
- Garrison (2006)
- Fort Peck (2007)

Water quality data collected from the RMPMP will be used to prepare project-specific reports as identified in ER 1110-2-8154, “*Water Quality and Environmental Management for Corps Civil Works Projects.*” As stated in ER 1110-2-8154, these reports are to be prepared for each project and updated as needed. These technical reports are to contain: 1) a general project description; 2) watershed characteristics; 3) physical project elements affecting water quality; 4) water quality management objectives; 5) data collection activities; 6) evaluation of water quality conditions, 7) effect of water control operations on water quality; and 8) a description of the physical, chemical, and biological processes that take place in the project, affect the project, or are affected by the project. The report is to comprehensively describe project water quality and the project’s impact on water quality. It is to identify specific concerns, problems, or opportunities.

It is envisioned that RMPMP monitoring will include expanded monthly monitoring during the period May through September and possibly some winter sampling in the reservoir. An objective of the RMPMP monitoring will be to enhance the spatial coverage of collected water quality data. This will include additional sampling along the longitudinal axis (e.g., every 10 miles) and sampling in major tributary embayments of the reservoir. In addition to the monitoring of traditional water quality parameters, sediment and biological (i.e., benthic macroinvertebrates, plankton, fish tissue) monitoring may be undertaken. Water quality information needs will be determined on a project-by-project basis prior to data collection. The RMPMP monitoring program will be implemented by the Omaha District’s Water Quality Unit with assistance from project personnel.

#### Investigative Monitoring

Investigative monitoring is typically initiated in response to an immediate need for water quality information. This may be in response to an operational situation at the project, the occurrence of a significant pollution event, public complaint, or a report of a fish kill. Any Omaha District response to a pollution event or fish kill would need to be appropriately coordinated with the

proper State and local agencies. The type of sampling that would be done for investigative purposes will be highly specific to the situation under investigation.

## **2.8. ACCESSIBILITY**

### **2.8.1. Road Access**

Good access is a prime factor in selecting a recreation site. The nearest major thoroughfares to Lewis and Clark Lake are Interstate 29, located 38 miles east of Gavins Point Dam, and Interstate 90, located 63 miles north of the dam. These highways provide access from the metropolitan areas of Sioux Falls, South Dakota; Sioux City, Iowa; and Omaha, Nebraska. The primary access to Lewis and Clark Lake is from U.S. Highway 81, a north/south highway through Yankton and from South Dakota Highway 50, which runs east/west and intersects Interstate 29.

State highways parallel both sides of the reservoir and are intersected by county roads that lead to the public use areas. In Nebraska, State Highway 12 is an average of seven miles south of the lake but crosses project land when it reaches the town of Niobrara, the upstream limit of the project. Several Nebraska recreation areas can be reached on Knox County Road R54C. In South Dakota, State Highways 50 and 52 are located approximately 4 miles north of the lake and are intersected by State Highway 37 that passes through Springfield and terminates in Running Water. Paved access roads serve all major recreation areas in the immediate vicinity of the dam. Other public use areas not in the immediate vicinity of the dam can be reached by hard-surfaced and/or all-weather roads.

### **2.8.2. Air Access**

A commercial airport located just north of Yankton provides the primary air access to the area. There is also a paved public landing strip one mile north of Springfield. Seaplane use of Lewis and Clark Lake is allowed if the rules, regulations, and restrictions contained in the Corps of Engineers Seaplane Landing Plan (Omaha District Pamphlet 1125-2-1) are followed. In addition, these aircraft must adhere to the prescribed Federal, State, and local statutes.

### **2.8.3. Lake Navigation**

The historic Running Water Ferry crossed the Missouri River from Running Water, South Dakota, to a point just east of Niobrara, Nebraska. The ferry operated at this location from 1875 until 1984, when the operator could not continue and the boat was sold. In March 1988, a "Ferry Boat Service Feasibility Study" was completed to determine whether service at the same location could be resumed. The study was prepared for the Nebraska Department of Roads and the South Dakota Department of Transportation.

Lewis and Clark Lake is classified as a navigable water of the United States. Although no commercial water travel exists on the lake, private recreational boats can navigate from the dam area near Yankton upstream to Fort Randall Dam near Pickstown. Boat operators are encouraged to participate in a Coast Guard-approved boat safety-training course.

## **2.9. CLIMATE**

Nature plays an important role in determining the development of the Great Plains region. Climate is the average course of the weather over a period of years, but weather in the Lewis and Clark Lake area is seldom average. Rapid weather changes are common. South Dakota and Nebraska are situated in the heart of North America and have a continental interior climate. Weather at the Gavins Point project is typical of a continental-interior climate; the variations from season to season and from year to year are great. Characteristics of the climate are hot summers and cold winters. The frost-free period averages 155 days. Lewis and Clark Lake has a long period of ice cover, even though it is the southernmost element of the main stem system. The median dates of ice cover are from December 1 to April 5. The average relative humidity in mid-afternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. Prolonged droughts of several years' duration and frequent shorter periods of deficient moisture, interspersed with periods of abundant precipitation, are characteristic of the plains area.

### **2.9.1. Temperature**

Temperatures range from in excess of 100 degrees Fahrenheit in summer to below 20 degrees Fahrenheit during winter. Because of the invasion of large air masses from the north or south, air temperatures may vary greatly from day to day. In winter, the average temperature is 24 degrees

Fahrenheit and the average daily minimum temperature is 14 degrees Fahrenheit. In summer, the average temperature is 72 degrees Fahrenheit and the average daily maximum temperature is 85 degrees Fahrenheit. Sunshine is abundant, particularly in the summer season.

### **2.9.2. Precipitation and Evaporation**

In the plains area of the basin upstream from Gavins Point Dam the annual precipitation in general decreases from southeast to northwest. Of the 25-inch annual precipitation in the counties adjacent to the lake, 80 percent usually falls from April through September. The amount of rainfall received by adjacent areas may vary widely during a given year. Thunderstorms occur on about 45 days each year. Most occur in summer and are generally local in extent. Tornadoes and severe thunderstorms strike occasionally. These storms are local, of short duration, and usually result in little damage because of the relatively low population of the area. Hailstones occur during the warmer part of the year in an irregular pattern and in small areas. Average seasonal snowfall is 34 inches. On the average, 29 days have at least one inch of snow on the ground, but the number of these days varies greatly from year to year.

### **2.9.3. Wind**

Wind has an adverse effect on project resources in several ways. Although primarily related to evaporation and erosion, it significantly affects the comfort and safety of visitors, particularly when they use the lake or river for fishing, hunting, swimming, or boating. The annual wind regime shows a pronounced shift from northwest winds during the winter to southerly winds during the summer. The spring months of April and May are characterized by winds from all points of the compass. Winds in excess of 50 M.P.H. are not uncommon. The prevailing wind is from the south-southeast during the recreation season. The average wind speed is highest, 14 M.P.H., in April.

## **2.10. TOPOGRAPHY, GEOLOGY, AND SOILS**

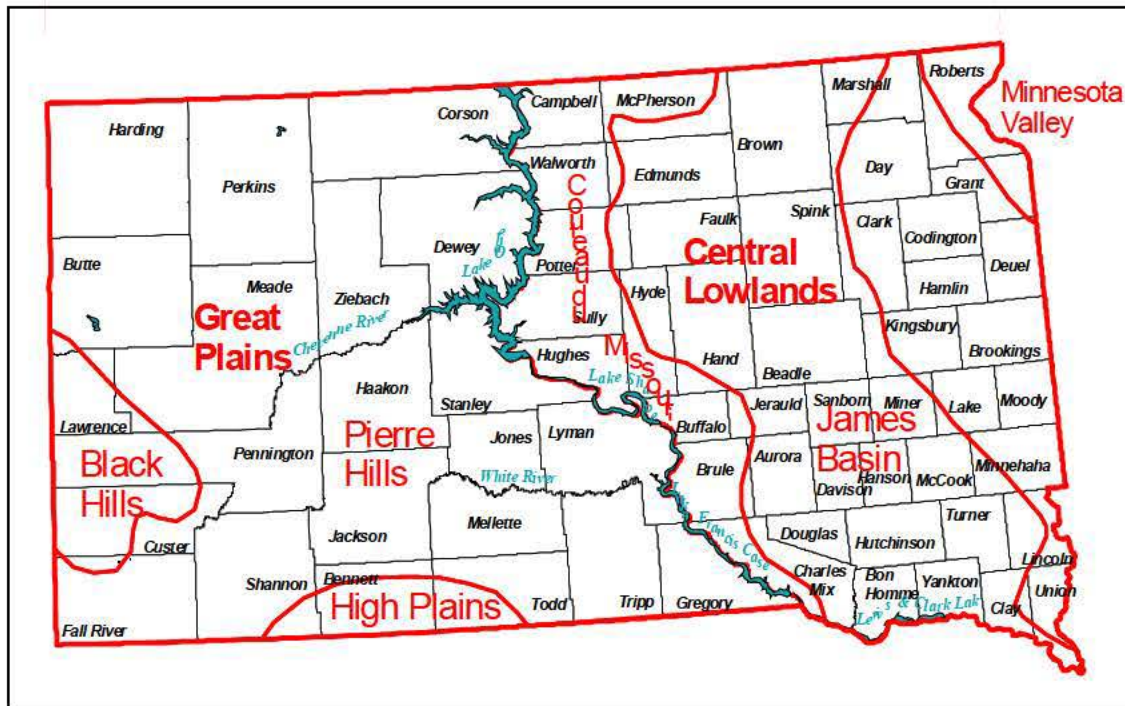
### **2.10.1. Topography**

The Gavins Point project is located in the Central Lowland physiographic province. This province

reflects the actions of several periods of glaciation. The Missouri River Valley divides the province into two sections, with the Western Young Drift section to the north and the Dissected Till Plains section to the south. The Western Young Drift section is characterized by young glacial plains, moraines, lakes, and lacustrine plains. This physiography reflects immature erosional development on the relatively young Wisconsin glacial drift. The Missouri River is the approximate limit of advance for the Wisconsin glacial ice sheet. The Dissected Till Plains section to the south of the river is characterized by sub-mature to mature dissected till plains. This nearly flat plain has been formed by erosion of the relatively older Kansan glacial drift. A mantle of loess measuring a few feet overlies the till, and relief varies from 100 to 300 feet.

The Missouri River Valley in the project area generally ranges from 1 to 3 miles in width. The elevation ranges from 1,169 feet m.s.l. on the flood plain below the dam to 1,450 feet m.s.l. along the right-bank bluff above the dam. Chalk bluffs frequently rise 60 to 100 feet above the lake level. The valley alluvium consists principally of sands with some silt, clay, or gravel, ranging in geologic age from Nebraskan to recent. The topographic variety provides an aesthetic backdrop for the recreation areas around the lake.

The Gavins Point Dam/Lewis and Clark Lake Project passes through two physiographic provinces, with the Central Lowlands Province on the east and the Great Plains Province on the west (Figure 2-9).



**Figure 2-9. Physiographic Divisions: South Dakota**

During the Pleistocene Epoch, movement of ice sheets southward over the relatively soft bedrock formations of the project area caused the accumulation of a heterogeneous mixture of rock materials within the ice mass. When the ice mass melted and receded northward, a mantle of relatively unconsolidated sediments called glacial drift was left where the ice had been. The glaciated area was covered by at least one and perhaps more than one ice advance. Most of the glaciated areas are gently rolling, undulating plains and relief is moderate. Gently rolling to steep glacial moraines are also seen in areas east of the lake. Drainages in the glaciated areas are generally poorly defined because of the rolling topography. Although there are few rivers, there is an abundance of lakes, ponds, and sloughs.

Uplands (badlands) in the project area have a typically gently sloping to steep topography with a few scattered buttes. Drainages in the unglaciated areas are generally better defined. These drainages were carved by running water eroding the soft, poorly cemented sands and clays of the exposed rocks. Terraces, buttes, and incised stream valleys are common.

### **2.10.2. Geology**

Bedrock in the project area consists principally of flat-lying Cretaceous and Tertiary strata, with some exposures of early Quaternary formations. In ascending order, they are the Cretaceous Carlile Shale, Niobrara Chalk, and Pierre Shale Formations; the Tertiary Ogallala Formation; and the Quaternary Grand Island Formation. The Carlile Shale is the bedrock in the lowest portions of the river valley. There are a few surface exposures of this formation downstream from Gavins Point Dam.

The Niobrara Chalk is the most prominent bedrock formation in the project area, forming the scenic white to light brown bluffs in the lower reservoir area. The Pierre Shale overlies the Niobrara Chalk, forming broad slopes along tributaries and atop the chalk bluffs. This formation is most prominent along the Nebraska side of the reservoir. This pale grayish-green to white formation is composed of silty clay, sand, and fine gravel with occasional thin lenses of massive orthoquartzite.

The fluvial deposits of the Quaternary Grand Island Formation can be found in a few scattered locations on each side of the river valley. The orange-pink formation is composed of fine-grained gravel and medium-grained sand. Beyond the areas adjacent to the reservoir, most of the region is covered by glacially derived deposits from the many episodes of glaciation that encroached upon the area. Wind-blown silt and sand cover most of the older deposits. Based on seismic history, the area is considered to have a low potential for earthquakes.

The bedrock surrounding Lewis and Clark Lake consists of nearly flat sedimentary rock ranging in origin from the Cretaceous to the Tertiary Periods. During Early Cretaceous time, most of the northern Great Plains Province was slowly eroding. Slow subsidence resulted in a gradual flooding by a shallow sea along whose advancing shoreline was deposited a uniformly sorted quartz sand. After the advance of the sea, thick beds of silt and clay accumulated in the deeper part of the sea basin; these beds are the Upper Cretaceous sediments and include the Pierre Shale. In Late Cretaceous time, the formation of mountains accompanied by some volcanic activity caused a gradual uplift of the land west of the sea. The uplift caused the sea to retreat southeastward and to become increasingly shallow. As shallowing progressed, near-shore sand was deposited which progressively covered the older clays.

### 2.10.3. Soils

Soils within the project area either have developed in place from the weathering of bedrock and glacial deposits or have been transported to the area by wind or flowing water. Soil maps resemble geologic maps of the area because the soils derive their locations and characteristics from the existing geologic materials. Other soil-forming factors such as slope and vegetation cause some variation from the geologic maps.

The soils in Cedar and Knox Counties in Nebraska formed mainly under grassland vegetation. In the uplands the most extensive parent material is Peoria loess. In the northern portion of the counties along Lewis and Clark Lake and the Missouri River, the parent material includes glacial till and glacial outwash, eolian material, residuum of soft sedimentary rock, and colluvium and alluvium derived from all of these materials. In South Dakota the southern border of Bon Homme and Yankton Counties is along the steep trench of the Missouri River. The breaks along the river are areas of loamy glacial till, clayey soils underlain by Pierre Shale, sandy soils, and silty soils underlain by Niobrara Chalk.

There are 11 soil associations found on the Gavins Point project. A soil association is a group of soils geographically associated in a characteristic repeating pattern. It normally consists of one or more major soils, and the association is named for the predominant soils. The soil associations listed in Table 2-13 are meant for general planning rather than as a basis for making decisions on the use of specific tracts. They provide a general guide for managing watersheds and wildlife areas, for conducting planning and engineering work, and for comparing the suitability of large areas for general land uses. More detailed information on locations, characteristics, and limitations of specific soil units within each soil association is included in the county soil surveys published by the U.S. Department of Agriculture in cooperation with State and county agencies.

Soil is produced by the action of soil-forming processes on “parent” material that was deposited or accumulated by geologic forces. The characteristics of the soil at any given point are determined by: (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material accumulated and weathered, (3) the plant and animal life on and in the soil, (4) the relief or lay of the land, and (5) the length of time the forces of soil development have acted on the soil material.

Differences in these soil formation factors result in different soil characteristics. Soils which have



similar profiles are classified by the Natural Resources Conservation Service (NRCS) as belonging to the same soil series. Two or more soil series are combined to form a soil association, which is a group of soils geographically associated in a characteristic pattern. The soil associations present in the Gavins Point Dam/Lewis and Clark Lake Project area are listed in Table 2-13.

**Table 2-13. Soil Associations, Gavins Point Project**

|  |
|--|
| <u>Crofton-Alcester</u> : Deep, steeply sloping to very steep, well-drained to excessively drained soils that formed in loess and colluvium on uplands and foot slopes (Cedar County).                         |
| <u>Sarpy-Blake-Albaton</u> : Deep, nearly level and very gently sloping, excessively drained to somewhat poorly drained sandy, silty, and clayey soils that formed in alluvium on bottom lands (Cedar County). |
| <u>Redstone-Gavins</u> : Moderately deep and shallow, nearly level to steep, well-drained and somewhat excessively drained silty soils that formed in residuum of siltstone on uplands (Cedar County).         |
| <u>Crofton-Boyd-Ethan</u> : Deep and moderately deep, steeply sloping to steep, well-drained silty, clayey, and sandy soils on uplands (Yankton County).   |
| <u>Forney-Haynie-Sarpy</u> : Deep, nearly level and gently undulating, poorly drained to excessively drained silty and sandy soils on floodplains (Yankton County).  |
| <u>Fluvaquents-Sarpy</u> : Very poorly drained and excessively drained, level and nearly level loamy and sandy soils on floodplains along the Missouri River (Bon Homme County).                               |
| <u>Eltree-Yankton-Alcester</u> : Well-drained and moderately well-drained, nearly level to steeply sloping silty soils on uplands and in upland swales (Bon Homme County).                                     |
| <u>Ethan-Boyd-Thurman</u> : Well-drained, moderately sloping to steep loamy, clayey, and sandy soils on uplands (Bon Homme County).  |
| <u>Labu-Bristow</u> : Well-drained, moderately deep, steeply sloping to steep soils on upland side slopes and along drainageways (Knox County).  |
| <u>Hord-Hobbs</u> : Deep, nearly level, well-drained soils on uplands, bottom lands, and terraces (Knox County).   |
| <u>Gibbon-Leshara</u> : Poorly drained, nearly level silty soils on bottomlands (Knox County).   |

## 2.11. LAND USE

General land uses in the project area range from fertile and humid river valleys to the east of the Missouri River to steadily increasing aridity and marginal ranch lands to the west. Prior to its purchase by the Corps of Engineers, project lands were primarily used for farming and grazing. Portions of the timbered Missouri River bottoms were cut by local residents for firewood, rough

lumber, and fence posts.

At the present time, agriculture represents the primary use of the land bordering the Gavins Point Dam/Lewis and Clark Lake Project. The remainder of the lands are devoted to recreation, wildlife, transportation, and urban areas. Woodlands are restricted to bottomlands adjacent to streams and to areas where plantings have occurred.

## **2.12. BORROW AREAS AND UTILITIES**

The only active borrow area on project lands is located in the southwest corner of the Project Operations Maintenance Area. This activity does not limit the use of this area, which is already appropriately allocated. The 115,000-volt transmission lines from the Gavins Point Dam switchyard have affected development in three recreation areas. The power lines, which parallel the Toe Road, have restricted development in the Cottonwood and Pierson Ranch Units; in the Overlook Unit, the power lines and the COE radio tower have affected the layout of the Lakeview Golf Course.

## **2.13. VEGETATION RESOURCES**

The region in which the project is located is dominated by the shortgrass ecosystem although the east bank demonstrates a good number of tallgrass species in some areas. The dominant grass species include western wheatgrass, little bluestem, sideoats grama, buffalo grass, and big bluestem on the better-managed tracts.

The different types of vegetative cover that occur around the Gavins Point Dam/Lewis and Clark Lake Project may be classified in the following types: (1) wetlands, (2) woodlands, and (3) grasslands. These vegetation types are briefly described below.

### **2.13.1. Wetlands**

Wetlands at the project are primarily located in delta areas upstream from Santee. Less extensive wetland areas are associated with the mouths of several small creeks flowing into the lake, and

marginal wetlands in the upper end of the lake have formed on the many bars of silts, sands, and clays which were deposited by the Niobrara River as it entered Lewis and Clark Lake. These marginal wetlands are dominated by cattail marshes. The remaining wetland areas consist predominantly of a mixture of cattails, giant reed, rushes, and reed canary grass. Purple loosestrife is a noxious aquatic plant that has infested about one-half of the delta area in varying degrees. This is discussed in greater detail in Chapter 3, Special Problems.

### **2.13.2. Woodlands**

There are few woodlands in the project area. Those that do exist are primarily restricted to deep ravines and steep hillsides of the dissected uplands. An extension of the eastern deciduous forest exists on project lands; however, this habitat type is not prevalent in the region. Eastern red cedar (*Juniperus virginiana*) has invaded the forest stands and has become the dominant tree species in the area. To a somewhat lesser extent, an association of bur oak, green ash, and American elm inhabits the hillsides and lower slopes and grades into a bottomland community dominated by eastern cottonwoods green ash, and box elder. Willows are commonly found along the lakeshore and in the small drainages. Shrub thickets existing separately and in zones along these woodlands include dogwood, western snowberry, wild plum, prickly ash, and smooth sumac.

### **2.13.3. Grasslands**

The region in which the Gavins Point project is located is largely dominated by the tallgrass and midgrass prairie ecosystems. Grasslands exist mainly on the upland ridge tops of the project lands and extend outward from the project onto the adjacent private lands. In the undisturbed areas of the project, these native grassland species reflect a transition between tallgrass and midgrass prairie and are characterized by big bluestem, little bluestem, western wheatgrass, and slender wheatgrass as the dominant species. On the more sandy soils, needlegrass and sideoats grama dominate. In disturbed areas, brome grass and various foxtail species are commonly found. Many forb species that are normally associated with transitional grasslands in this geographical area are found both in the undisturbed and disturbed areas.

## **2.14. FISH AND WILDLIFE RESOURCES**

### **2.14.1. Fisheries**

When Lewis and Clark Lake was created by the closing of Gavins Point Dam, the aquatic ecology of this section of the Missouri River was changed from a lotic (living in actively moving water) environment to predominantly lentic (living in still water) conditions. The fish species now present in the lake reflect both of these ecological conditions. Common fish species at Lewis and Clark Lake include shovelnose and pallid sturgeon; paddlefish; shortnose gar; gizzard shad; freshwater drum; northern pike; channel, flathead, and blue catfish; white bass; common carp; blue and white sucker; river carpsucker; bigmouth and smallmouth buffalo; northern redhorse; golden, emerald, and common shiners; fathead minnow; green sunfish; bluegill; white and black crappie; yellow perch; largemouth and smallmouth bass; walleye; and sauger.

The National Fish Hatchery and Aquarium located downstream from Gavins Point Dam in South Dakota is a popular attraction. The hatchery produces both warm water and cool water fish that will be stocked in Federal and State waters as well as in farm and ranch ponds.

### **2.14.2. Birds**

A large variety of bird species either reside at or seasonally migrate through the Gavins Point project. Wetlands in the upper reaches of the lake contribute to the breeding environment for wood, teal, mallard, and Northern pintail ducks. Lewis and Clark Lake is located along the Central Flyway for the North American continent. Many varieties of birds use this migratory route and the diversity of habitats associated with the project. Other wetland species include the great blue heron, double-crested cormorant, red-winged blackbird, American pelican, Canada goose, and grebes. Shorebirds include killdeer, spotted sandpiper, the endangered interior least tern, and the threatened piping plover. The ring-billed gull and Franklin's gull are also located here.

The threatened bald eagle winters near the open tailwaters downstream from the dam where a food supply of fish is readily available. The endangered peregrine falcon has also been observed migrating through this area. Ospreys and turkey vultures soar over the lake and perch on the chalk bluffs. Other raptor species include the red-tailed hawk and American kestrel. Ring-necked

pheasants, sharp-tailed grouse, mourning doves, and wild turkeys are also common at the project, in addition to four woodpecker species, five swallow species, blue jay, eastern phoebe, American crow, gray catbird, American robin, European starling, northern cardinal, common grackle, northern oriole, American goldfinch, various thrush and sparrow species, and several warbler species that are mostly spring and fall migrants.

While the species list above is not exhaustive for the project, it does illustrate that the birds at and around Lewis and Clark Lake can be characterized by species associated with wetlands, eastern woodlands, the woodland/meadow ecotone (boundary zone) and open grassland.

### **2.14.3. Mammals**

The mammals found in the Gavins Point Dam/Lewis and Clark Lake Project area include big game and small game species, various furbearers, and numerous rodents.

White-tailed deer and mule deer are the only big-game species commonly found at the project. White-tailed deer may be found throughout the length of the impoundment on both sides of the lake. Mule deer are present in lesser numbers and are more closely associated with the rough and broken terrain along the lake and uplands.

Small furbearing animals in the project area include red fox, coyote, raccoon, mink, badger, weasel, muskrat, woodchuck, opossum, striped and spotted skunk, beaver, rabbit, and bobcat. Their populations fluctuate, but only the bobcat is considered scarce. Other small mammals in the project area include the fox squirrel, thirteen-lined ground squirrel, Richardson's ground squirrel, plains pocket gopher, and common species of field mice, voles, and rats.

### **2.14.4. Reptiles and Amphibians**

Nonpoisonous snake species present within the project area include the bull snake, plains garter snake, red-sided garter snake, common water snake, king snake, yellow-bellied racer, and blue racer. Rattlesnakes have also been observed west of Santee near Crazy Peak. The prairie rattlesnake is the only poisonous reptile found in the Gavins Point project area and is rarely observed. Other common reptiles found in the project area are the common snapping turtle,

midland painted turtle, and western spring soft-shelled turtle. Amphibians inhabiting the marsh areas include bullfrog, leopard frogs, Great Plains toads, and tiger salamanders.

## 2.15. RARE AND ENDANGERED SPECIES AND COMMUNITIES

The variety of habitats existing on the Gavins Point Dam/Lewis and Clark Lake Project affords the opportunity for several species and rare communities to exist on project lands. This factor makes it a necessity that rare, threatened, and endangered species are considered in all planning, operations, and management activities in order to reduce the level of environmental degradation within project boundaries.

### 2.15.1. Federally Listed Species

The USFWS did not respond to an April 29, 2004 letter requesting agency comments on the draft Gavins Point Dam/Lewis and Clark Lake Master Plan update and draft Environmental Assessment. However, according to USFWS web sites for Nebraska and South Dakota, appropriate habitat for ten federally endangered and threatened species exists in Bon Homme and Yankton Counties, South Dakota, and Cedar and Knox Counties, Nebraska (USFWS 2003a, 2004; Table 2-14).

**Table 2-14. Listed species in the Lewis and Clark Lake Region**

| Species Common Name | Scientific Name                         | Counties                          | ESA Listing |
|---------------------|---|-----------------------------------|-------------|
| Bald eagle          | <i>Haliaeetus leucocephalus</i>         | Bon Homme, Yankton<br>Cedar, Knox | Threatened  |
| Black-footed ferret | <i>Mustela nigripes</i>                 | Knox                              | Endangered  |
| Eskimo curlew       | <i>Numenius borealis</i>                | Yankton                           | Endangered  |
| Interior least tern | <i>Sterna antillarum<br/>athalassos</i> | Bon Homme, Yankton<br>Cedar, Knox | Endangered  |
| Pallid sturgeon     | <i>Scaphirhynchus albus</i>             | Bon Homme, Yankton<br>Cedar, Knox | Endangered  |

**Table 2-14 (continued). Listed species in the Lewis and Clark Lake Region**

| Species Common Name            | Scientific Name              | Counties                          | ESA Listing |
|--------------------------------|------------------------------|-----------------------------------|-------------|
| Piping plover                  | <i>Charadrius melodus</i>    | Bon Homme, Yankton<br>Cedar, Knox | Threatened  |
| Scaleshell mussel              | <i>Leptodea leptodon</i>     | Yankton                           | Endangered  |
| Topeka shiner                  | <i>Notropis topeka</i>       | Yankton                           | Endangered  |
| Western prairie fringed orchid | <i>Platanthera praeclara</i> | Yankton                           | Threatened  |
| Whooping Crane                 | <i>Grus americana</i>        | Knox                              | Endangered  |

### Bald Eagle

Bald eagles are found throughout the continental United States and Canada (USFWS 2000). In the Midwest, breeding primarily occurs in Minnesota, Wisconsin, and Michigan. Bald eagles prefer to nest in trees near water, but may also nest on cliffs or the ground. Preferred trees are near shorelines, well separated from disturbed areas, and sturdy enough to support a nest that averages five feet wide and three feet deep. Eagle diets are typically comprised almost exclusively of fish, but may also consist of waterfowl, carrion, or small prairie mammals.

Bald eagles migrate throughout the area and use mature riparian timber near streams, lakes, and wetlands (USFWS 2002b). There are three major areas of mature cottonwood timber remaining on the Missouri River in South Dakota known to support wintering populations of bald eagles. These areas include portions of the Missouri National Recreational River, particularly in the Yankton/James River Island area (USFWS 2000). Bald eagle wintering habitat on the Missouri National Recreational River below the Gavins Point Dam also has also been identified (USACE 2004b). In the Main Stem Missouri River region, bottomland cottonwood habitats provide habitat for bald eagles, but have been reduced in the project area by reservoir inundation or agricultural and community development (USFWS 2000). Eagles use the remaining available cottonwood forest habitats that are also near available forage, in particular near tailraces of dams where fish are readily available.

### Black-Footed Ferret

Black-footed ferrets were once found throughout the Great Plains, from Texas to southern Saskatchewan, Canada. Their range extended from the Rocky Mountains east through the Dakotas and south through Nebraska, Kansas, Oklahoma, Texas, New Mexico, and Arizona. Black-footed ferrets eat prairie dogs and live in prairie dog burrows in grasslands.

The main causes of the decline in the ferret population have included habitat conversion for farming, efforts to eliminate prairie dogs, and sylvatic plague, a disease that affected both black-footed ferret and prairie dog populations.

During the fall of 1986 and the spring of 1987 the last known 18 wild black-footed ferrets were captured and placed into captive breeding facilities. In 1991, the first reintroductions of black-footed ferrets into the wild began with releases of ferrets in the Shirley Basin area of Wyoming. Since then, other reintroductions have occurred in Colorado, Arizona, Montana, and South Dakota (NatureServe 2004).

### Eskimo Curlew

The Eskimo curlew is a shorebird that historically migrated north through tallgrass prairies in the Great Plains to breeding areas in Alaska and the Northwest Territories. Once abundant, it is now nearly extinct or perhaps extinct as no reliable sightings have been made since 1987. The last reliable sightings were made in Mormon Island, Nebraska; Lac Rendezvous, Northwest Territories; and North Haven Island, Maine; only single birds were observed (NatureServe 2004).

### Interior Least Tern

The least tern is a migratory bird that historically bred along the Mississippi, Missouri, Arkansas, Red, Rio Grande, and Ohio River systems. The historic range extended from eastern Colorado to southern Indiana and from Texas to Montana. The least tern still breeds in most of its historic breeding range, but populations are fragmented and generally found in less-altered river segments (USFWS 1990). Precise locations of wintering areas of the least tern remain unknown.



Least terns arrive at breeding areas from late April to early June and spend four to five months at the breeding sites (USFWS 2000). The birds nest as lone pairs or in colonies with more than 100 pairs. The nests are constructed of small stones and debris in shallow depressions on an open sandy area, gravel patch, or other exposed substrate. Both sexes participate in incubation of two to three eggs, usually lasting 20 to 25 days. Chicks hatch within one day of each other and fledge after 18 days. Adults jointly care for and feed the young even after fledging. Life spans have been reported to range from five to fifteen years (USFWS 2000). River hydrology and sandbar geophysiography are significant elements of least tern habitat. Least terns select nesting sites on open areas of sand or gravel beaches within a river channel or reservoir shoreline (USFWS 2000). Nests are usually located in areas that are well drained, devoid of vegetation, and at a distance from the water line. Foraging habitats include side channels, sloughs, tributaries, and shallow-water habitats adjacent to islands and the main channel (USFWS 2000). Least terns typically feed on small fish in shallow areas less than 400 yards from the nest site (USFWS 1990).

Least terns are known to be present on the Gavins Point Project area (USFWS 2000). Least terns nest on sandbars in the delta just downstream of the Niobrara River confluence and just upstream of the Santee Reservation banks (USACE 2004b). Between 1990 and 2003, numbers of adult least terns at Lewis and Clark Lake averaged 54 annually and have ranged from 16 in 1995 to 120 in 1998 (USACE 2004a). Nesting typically occurs on sandbars in the delta, downstream of the mouth of the Niobrara River and upstream of the Santee Reservation banks. The population is low in most years, but a significant increase in numbers occurred following a high water year in 1997. Colony sites are usually located in open expanses of sand or pebble beach within river channel or along shoreline (USFWS 2000). Least terns prefer to nest in areas with sparse or no vegetative cover (Schulenberg and Placek 1984). Terns are opportunistic and piscivorous, taking a wide variety of species and sizes of fish from the shallow waters of rivers, streams, and lakes (USFWS 1990).

### Pallid Sturgeon

Pallid sturgeon are found in the Missouri River and in the Mississippi River downstream of the Missouri River confluence (Gilbraith *et al.* 1988). Pallid sturgeon spawn in late April or early May in the lower Missouri River and middle Mississippi River and in late May and early June in the upper Missouri River. Spawning is suspected to occur in swift water in the main channel when water temperatures are 56 to 66°F (Keenlyne and Jenkins 1993). Adhesive eggs are released into the water column in deep channels over firm substrate. Males reach sexual maturity at approximately 22 inches in length and females mature at age 7 to age 20 depending on environmental conditions (USFWS 2000a). Fecundities greater than 100,000 eggs have been

observed but are variable depending on fish size and environmental conditions. Pallid sturgeon are long-lived, reaching ages over 50 years.

Pallid sturgeon are adapted to big river environments with dynamic flows, high velocities, and high turbidity. Adults are frequently found in deep pools or slow velocity areas with sandy substrate in or adjoining floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channels (USFWS 2000a). Pallid sturgeon are typically bottom dwellers in rivers with swift, turbid, and free flowing waters. Fish are the preferred food of pallid sturgeons, although aquatic insect larvae are also consumed in earlier life stages.

Pallid sturgeon populations or individuals are found in only a few selected areas within the Missouri River. The USFWS samples for pallid sturgeon between Fort Randall Dam and the headwaters of Lewis and Clark Lake (personal communication, Wayne Stancill, USFWS). The reservoir headwaters are defined as the transition area occurring along a line drawn from the Santee Sioux Indian Reservation boat ramp in Nebraska to the boat ramp at Springfield, South Dakota. In 2003 the USFWS completed a 3-year radio telemetry project with hatchery propagated juvenile pallid sturgeon and never relocated a pallid sturgeon below the reservoir headwaters during the study. Biologists with the South Dakota Game Fish and Parks Department have collected a few of the hatchery propagated juvenile pallids below the headwaters during their recreational fisheries surveys and the USFWS hears of anglers catching them periodically in the upper end of the Reservoir (personal communication, Wayne Stancill, USFWS). The Pallid Sturgeon Recovery Plan (USFWS 1993) identified six recovery-priority management areas that still provide suitable habitat. Recovery-Priority Area 3 is the portion of the Missouri River that is located 20 miles upstream of the Niobrara River and Lewis and Clark Lake.

### Piping Plover

The piping plover is a migratory shorebird found in north-central North America. Piping plovers historically bred in three areas of North America, including (1) Atlantic coastal beaches from Newfoundland to South Carolina, (2) beaches of the Great Lakes, and (3) the northern Great Plains/Prairie region from Alberta to Ontario and south to Nebraska (USFWS 1988). Winter habitat areas are not well known although piping plovers have been observed along the Gulf of Mexico, on southern Atlantic coastal beaches from North Carolina to Florida, in eastern Mexico, and on scattered Caribbean Islands (Haig and Oring 1985). Piping plover habitat remains distributed across much of the species' historic range, although in a much reduced and fragmented condition. Piping plovers nest on the barren sand and gravel beaches of the Great

Lakes and on alkali wetlands, gravel shorelines, and river sandbars in the Great Plains. Feeding plovers utilize open, wet, sandy areas, feeding primarily on exposed substrates by pecking for invertebrates at or just below the surface (Cairns 1977).

Between 1990 and 2003, numbers of adult piping plovers at Lewis and Clark Lake averaged 30 annually and have ranged from 4 in 1995 to 84 in 1998 (USACE 2004a). Nesting has been documented on the Missouri River main stem from Valley County, Montana to Dixon County, Nebraska with more than 25 percent of the nesting occurring between Gavins Point Dam and Ponca, Nebraska. The Missouri River provides important nesting habitat during drought conditions when ephemeral wetland nesting habitats dry up. In the Missouri River main stem reservoirs, plovers nest along shorelines of reservoirs when the habitats are available. Nesting colonies have been confirmed on sandbars in the Missouri River near the upper end of Lewis and Clark Lake (USFWS 2002b). The USFWS has designated critical habitat for the northern Great Plains breeding population on the Missouri River and Lewis and Clark Lake.

#### Scaleshell Mussel

Historically this mussel species was distributed through 54 streams in much of the Interior Basin and a portion of the St. Lawrence drainage. Within the latter, records are primarily from the Lake Erie basin incorporating portions of western New York, southern Ontario, and southern Michigan. Interior Basin records are from streams in Ohio, Kentucky, Tennessee, Indiana, Illinois, southern Wisconsin, Iowa, Missouri, Kansas, Arkansas, and Oklahoma. The only known extant populations are now restricted to 13 streams in the Interior Highland divisions in Missouri, Arkansas, and Oklahoma (NatureServe 2004). The mussel occurs in medium to large rivers with low to moderate gradients in a variety of stream habitats including gravel, cobble, boulders, and occasionally mud or sand substrates and is restricted to rivers with relatively good water quality (NatureServe 2004). A fresh dead scaleshell mussel specimen was collected in the early 1980s one kilometer downstream of Gavins Point Dam (Perkins and Backlund 2000). Although no specimens were collected in 1996 and 1999 mussel surveys conducted downstream of the dam, this species tends to bury itself deeper than other species, making it hard to locate, and there are likely other individuals in the river system (Perkins and Backlund 2000).

### Topeka Shiner

The Topeka shiner is a fish species that was formerly widespread in western tributaries of the Mississippi River, from central Missouri to southern Minnesota, west to southeastern South Dakota and western Kansas (NatureServe 2004). It still occurs in all six states in its historical range but is now restricted to small areas in Kansas, Missouri, Iowa, Nebraska, South Dakota, and Minnesota, with most of the remaining populations existing in Kansas. In South Dakota, the Topeka shiner was formerly common in the Big Sioux, Vermillion, and James River drainages and still persists there but in low numbers. In Nebraska, it exists in the upper Loup River drainage and in the Elkhorn River basin, but very few individuals have been recorded in recent years. Topeka shiners inhabit a variety of high-quality prairie streams, but they are intolerant of certain human-caused disturbances and habitat alterations. For example, streams that have been channelized or impounded or that drain cultivated fields generally are not suitable habitat.

### Western Prairie Fringed Orchid

The Western Prairie Fringed Orchid ranges in occurrence from Manitoba, Canada, south to Oklahoma, east to Iowa, and west to central Nebraska. This flowering plant is usually similar in height to surrounding prairie grasses, with smooth, yellow-green foliage. Mature plants can grow up to 42 inches in height, but typically reach 20 to 30 inches in height. Non-flowering plants may consist of only a single basal leaf and can be very difficult to find. The Western Prairie Fringed Orchid inhabits tallgrass calcareous silt loam or sub-irrigated sand prairies (Fritz 1993). In the northeastern Nebraska region, it is found in wet-mesic prairies and sedge meadows in alluvial soils of river floodplains that are moderate to high in quality and unplowed.

No populations are known to occur within the project area. However, any tracts of typical prairie habitats for the plant should be considered as potential habitat.

### Whooping Crane

The whooping crane formerly wintered in the tallgrass prairies of Louisiana and from Texas to central Mexico, migrating through the Great Plains to Canada and North and South Dakota for the breeding season. The total North American population of wild and captive whooping cranes at the end of 2003 was 426 (USFWS 2003b) and the numbers are increasing. The whooping crane

inhabits freshwater marshes and wet prairies, and in migration and during winter it is also found in grain and stubble fields and on shallow lakes and lagoons. It winters on salt flats, marshes, and along barrier islands.

### **2.15.2. State Listed Species**

In addition to the Federally listed species tracked by the Nebraska Natural Heritage Program, a number of State listed species are also monitored. Records of occurrence indicate that the State threatened lake sturgeon (*Acipenser fulvescens*) may also be present on the project area.

#### Lake Sturgeon

The distribution of the lake sturgeon ranges from the main stem Missouri River and the Mississippi River to the Great Lakes region of the United States and Canada (Zuerlein 1993). The lake sturgeon is similar in appearance to the pallid sturgeon, but can grow larger, reaching lengths over seven feet, and can weigh over 300 pounds. Lake sturgeon inhabit both lakes and rivers. Spawning generally occurs from late April to late June during high water with water temperatures between 53 to 64°F. Lake sturgeon are bottom-dwelling and occur in large rivers and shallow areas of large lakes where small benthic prey items are abundant. In rivers, lake sturgeon occupy similar habitats as the pallid sturgeon, as they are usually found in deep run and pool habitats. The lake sturgeon is extremely rare in Nebraska and is especially susceptible to extinction.

### **2.15.3. Other Species and Communities**

Species and community monitoring and status data provided by the South Dakota and Nebraska Natural Heritage Programs will be incorporated into this report as it becomes available.

### **2.15.4. Biological Opinion**

The USFWS reviewed the operation of the Missouri River main stem reservoir system, operation and maintenance of the Missouri River bank stabilization and navigation project, and operation of the Kansas River reservoir system in 2000 and prepared a biological opinion (USFWS 2000). In

the opinion, these projects were all found to have cumulative effects that are likely to jeopardize the continued existence of the least tern, piping plover, and pallid sturgeon. A Reasonable and Prudent Alternative (RPA) was developed by the USFWS that includes actions that are intended to decrease the likelihood of jeopardizing the continued existence of these three species. An implementation plan for the RPA was prepared and this Master Plan must take into consideration the measures proposed in the RPA and work in coordination with the implementation of the biological opinion (USACE 2001). No measures proposed in the Master Plan may interfere with the measures of the RPA. Components of the RPA include flow enhancement, habitat restoration/creation/acquisition, unbalances system regulation, adaptive management/monitoring, and propagation/augmentation of pallid sturgeon populations. More detail is provided in the biological opinion document (USFWS 2000).

## **2.16. VISUAL QUALITIES**

The terrain surrounding Lewis and Clark Lake offers a wide variety of scenic vistas. The dam and the beauty of the lake, the dramatic effect of the chalk bluffs intersected by heavily wooded ravines, and the rolling hills of the prairie form an ever-changing background. Driving or walking through native woods, across meadows, and past scenic overlooks can add interest and enjoyment to a Lewis and Clark Lake visit. The lake extends upstream from the dam about 25 miles, then changes into a meandering river much as Meriwether Lewis and William Clark knew it. The approach to the upstream end of the lake brings a significant change in the scenery. Where the Niobrara River enters the lake, a delta has formed and a marsh/wetland environment has developed. In many places the lake appears to be a sea of marsh grasses and, with the rising water table, the area of aquatic and near-aquatic plants continues to grow. The marsh and woodlands provide a haven for birds and waterfowl on their annual migration through this area.

## **2.17. MINERAL AND TIMBER RESOURCES**

Mineral resources around Lewis and Clark Lake consist of sand and gravel deposits, Pierre Shale, and Niobrara Chalk. The sand and gravel deposits are mined for road construction materials and concrete aggregate. Some Niobrara chalk rock is mined for use as agricultural lime. During the period 1891-1910, a quarry in the Niobrara Chalk near Gavins Point Dam produced 1,900,000 barrels of cement. Today there are no mining activities being conducted on project lands.

Native woodlands in the project area occur in narrow bands and clumps along the rivers and

intermittent streams, on steep side slopes, and in the upland areas of the project. Timber resources are not commercially utilized at the Gavins Point project.

## **2.18. PALEONTOLOGY**

The Missouri River trench in South Dakota has been internationally known for fossil vertebrate and invertebrate remains since the time of Lewis and Clark. In this early expedition, fossil vertebrates were recorded which probably represent marine reptiles, either plesiosaurs or mosasaurs. Later expeditions in the 1800s also resulted in collections of marine reptiles, some of which were new to science and became type specimens. All during the period in which the Missouri River was a major travel corridor, fossils were secured and transported to museums in the Northeast and Europe. As the waterway became less traveled, collections from these rocks declined. Through cooperation between the Corps, the SD School of Mines and Technology, and the New Jersey State Museum, the systematic recovery of fossil remains has resumed.

## **2.19. CULTURAL RESOURCES**

A number of cultural resources are located on project lands. These resources represent physical remains that archaeologists refer to as sites, objects, artifacts, features, components, structures, and a number of other terms that describe the physical remains of past human occupation and use.

In order to understand earlier human occupation, archaeologists divide time into periods that highlight important or unique human activities. For the project area, the prehistory and history are divided into five broad periods: Paleo-Indian, Archaic, Woodland, Plains Village, and Historic.

### **2.19.1. Prehistoric and Historic Periods**

Much of the history and prehistory of the region has been shaped by the Missouri River. To the aboriginal peoples in prehistoric times, the river served as a major highway for trade and travel. The rich floodplain soils offered an excellent place for the earthlodge village peoples to raise their crops. Regular floods replenished both the soil nutrients and subsoil moisture for the season.

The region's cultural history has been described as one of the four major regions north of Mexico. The Missouri Trench, and the Great Plains in general, make up one of the most fascinating cultural areas in the Western Hemisphere. The archaeology of the Missouri Trench consists of layers of occupation dating back to the post-Wisconsin glacial period (11,000 Before Present (B.P.)). Every significant time period is represented, from the Paleo-Indian Tradition starting at 12,000 B.P. to the historic period of Euro-American settlement to the present.

As shown on Table 2-15, the Gavins Point Dam/Lewis and Clark Lake Project has approximately 80 historic and prehistoric sites. Many of these sites have not been evaluated for their significance to the National Register of Historic Places (NRHP). Sites may contain one or more artifacts. In some cases, a number of the sites contain two or more different periods of use. The following cultural history is based on information derived from sites in and near the project area.

**Table 2-15. Cultural Resources at Main Stem Projects**

| <b>Cultural Resources</b>          | <b>Gavins Point</b> | <b>Garrison</b> | <b>Oahe</b> | <b>Big Bend</b> | <b>Fort Randall</b> | <b>Fort Peck</b> |
|------------------------------------|---------------------|-----------------|-------------|-----------------|---------------------|------------------|
| Number of Sites (rounded)          | 69                  | 800             | 1200        | 400             | 150                 | 5                |
| National Register Quality Sites    | 5                   | 40              | 50          | 84              | 24                  | 1                |
| Shoreline Miles                    | 90                  | 1340            | 2250        | 200             | 540                 | 1520             |
| Number of Sites per Shoreline mile | 0.9                 | 0.6             | 0.3         | 2.0             | 0.3                 | N/A <sup>2</sup> |

<sup>1</sup> The number of cultural resource sites that are listed on, eligible for, or potentially eligible for the NRHP. The number of historic properties is expected to increase.

<sup>2</sup> Not available. Surveys incomplete.

Paleo-Indian Period (10,000-6,000 B.C.). The Paleo-Indian Period consisted of big game hunters and gatherers. These peoples hunted the mammoth, mastodon, and bison. The artifacts that they left behind include large lanceolate projectile points, butchering areas, and campsites. Because of their age, these sites are fairly rare. Presumably, many of these sites have been destroyed by river meanders, wave action, slumping, erosion, or other causes. The few Paleo-Indian sites that do remain on the northern plains are important in terms of what can be learned about these early peoples and the environment of the time. Because of their scarcity, any site found to be of this age would almost certainly be eligible for the NRHP. No sites dating to this period have been reported in the project area or in adjacent areas.



Archaic Period (6,000-A.D. 1). During the Archaic Period the big game animals mentioned previously had become extinct. The people of the period hunted a large variety of game including deer, bison, elk, pronghorn, rabbit, and other small mammals, fish, and amphibians. Spears and darts were the primary weapons used. It appears that these people were nomadic and most likely followed the seasonal migrations, journeying to various locations in their region to gather nuts, seeds, and berries to take advantage of the locally available food sources. As with the Paleo-Indian sites, this site type is quite rare, probably because of the amount of impacts that have occurred to them over time. One major site associated with this period, the Tramp Deep Site, is associated with this period.

Woodland Period (A.D. 1-950). The occurrence of new technologies, domestic dwellings, and social activities marked the transition from the Archaic to the Woodland Period. Large burial mounds provide evidence of organized religion. Permanent villages and associated horticultural tools indicate a reliable subsistence base that included the beginnings of agriculture. The bow and arrow, as well as pottery, came into being at this time. During the woodland period, cultures flourished. Woodland burial mounds and other material from this period have been found in the project area.

Plains Village Period (A.D. 950-1780). This period represents a climax in the prehistory of the Great Plains. The peoples of this period lived in large villages with many substantial earthen lodges within the boundary. Many of these villages were fortified with a deep ditch or moat-like structure, further protected by a palisade, or log wall. These security measures indicate that there was intense competition for the resources along the Missouri River during this time period. Several important sites from this period are located in the project area.

In addition to constructing sturdy villages, the Plains Village people raised crops on the floodplains (primarily corn, beans, squash, and sunflowers) and participated in regular buffalo hunts. They produced excellent quality pottery and made tools from stone and bone. In spite of the reliable subsistence base of crops and bison, Euro-American diseases and the westward expansion of pioneers and homesteaders had adverse impacts on the health of the peoples of this period and many died. Several important sites from this period are located in the project area.

Equestrian Period (A.D. 1720-1880). This period's (which overlaps the Historic Period) most important component is the horse. Sites were temporary in nature, as tipis were easily and often moved. Sites that pertain to this period are rare in the project area.

Historic Period (1780-1930). This time period is characterized by written records of the historical accounts of the time. The Historic Period began when Euro-Americans started to explore and settle the plains. The location of historic sites and landmarks are shown in Figure 2-10. Captains Meriwether Lewis and William Clark first officially explored the area (part of the Louisiana purchase) under a commission from President Thomas Jefferson in 1804. The Lewis and Clark expedition was in and around the project area August 28 through September 3 in 1804. On August 28, 1804, the expedition left the Riviere aux Jacques (now the James River) and began to move upstream. They camped for three days opposite and slightly downstream from present-day Yankton, South Dakota. During that time, Sergeant Pryor and the interpreter made contact with the principal Indian chiefs of the region. They invited five chiefs of the Yanktonnai Sioux to a council meeting on August 30 near Calumet Bluff, which is now the site of the Gavins Point powerhouse. After the council meeting, the expedition proceeded upstream and camped near Bon Homme Island on September 1, 1804. On September 2 the expedition was only able to make four miles before being forced ashore to camp near "a yellow clay bluff 110 feet high." On the 3rd of September, the expedition set out and proceeded to the mouth of Emanuel Creek. Clark explored the Niobrara for a few miles upstream on September 4, 1804. In 1978, Public-Law 95-625 established the Lewis and Clark National Historic Trails System. The purposes of establishing a national historic trail were to identify and protect historic routes important in the development of our nation and to provide for public use and enjoyment through recreation and historic interpretation.

Later historic sites include a camp used by the Yankton Sioux under Chief Smutty Bear, some Native American and Euro-American homesteads, and the abandoned town of Bon Homme. The Bon Homme Bruderhof, better known as the Bon Homme Hutterite Colony, was established in 1874 when 60 Hutterite families, recent migrants from the Ukraine, purchased land along the Missouri River. The Bon Homme Hutterite Colony is currently located immediately outside the project boundaries and is listed on the National Register of Historic Places (NRHP). Over 40 colonies currently exist in South Dakota—all derived from the original Bon Homme Colony.

Riverboat traffic increased during the steamboat era. During the navigation season, steamboats were able to go as far upstream as Fort Benton, Montana. Use of the Missouri River was a major factor in westward expansion, and Yankton was a major river port.

Two groups of Native Americans have lived in the Gavins Point project area during recent time. The northern band of the Ponca lived near the present-day site of Niobrara. After the Federal trust relationship with the northern band was terminated in 1962, tribal members assimilated with the present population. The Santee Sioux currently occupy a reservation created in 1866 and located four miles east of Niobrara. The Santee formerly lived in Minnesota and in 1985 numbered 518 members.

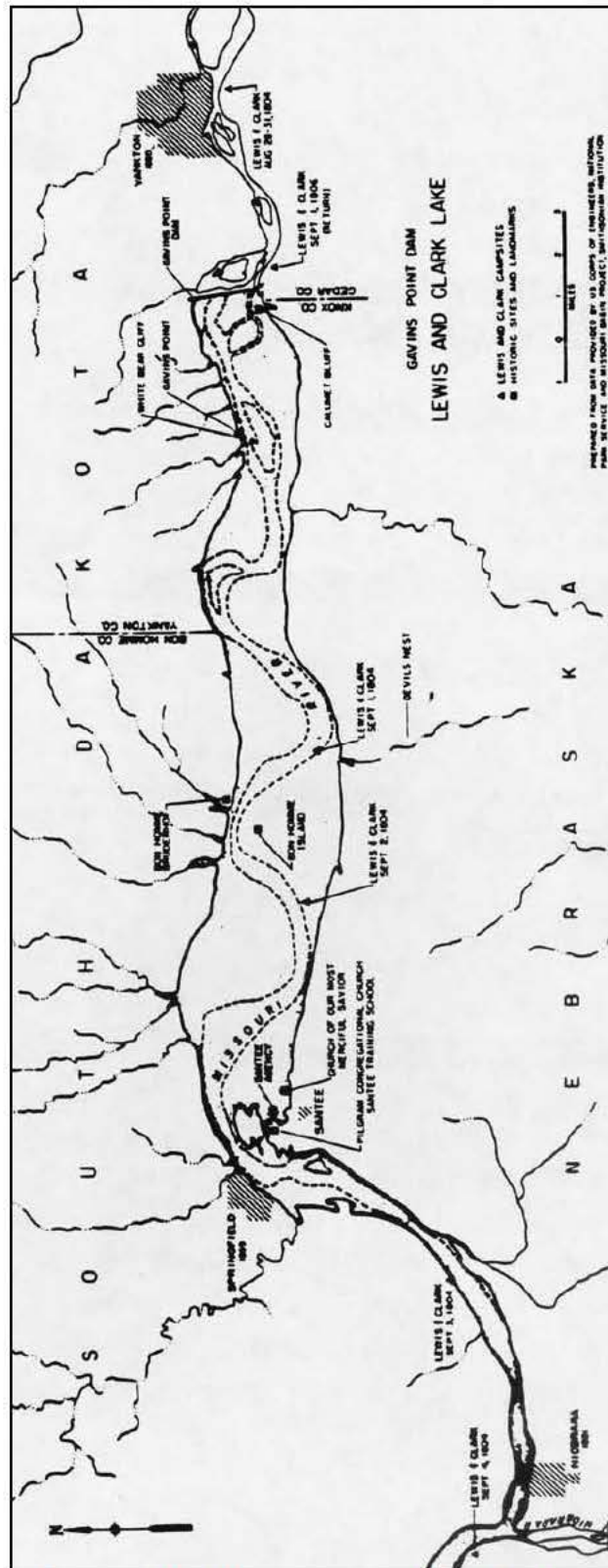
There are a number of sites associated with the Historic Period distributed throughout the project area. Some of these sites are underwater but of the remainder, some still contain buildings, surface artifact scatters, depressions, and foundations. Farming and erosion have obscured some additional historic features.

### **2.19.2. Cultural Resource Management**

A Cultural Resource Management Plan (CRMP) has been prepared for the Gavins Point Project, and is stored at the Omaha District office.

In general, there are several methods for managing the historic properties on project land. If a significant site is not being threatened by any impacts such as erosion, vandalism, agricultural impacts, or construction, it is best to leave the site undisturbed. Sites are best protected by a thick growth of vegetation that serves as a type of disguise for the features within the site. If a significant site is being threatened in some manner, it is pertinent to remove the threat or to protect the site. Resources that are either on or eligible for listing on the NRHP are called historic properties. These properties could include those from any prehistoric or historic period. Those resources that do not meet the National Register evaluation criteria may be disregarded with respect to Federal compliance requirements once the "not eligible" determination is made and the official determination process is complete.

Some potential land uses of the Gavins Point Dam/Lewis and Clark Lake project lands may not be compatible with the Omaha District's responsibility to manage historic properties that are located within project boundaries. Therefore, it is necessary to place some restrictions on use so that current and future land use will not impact historic properties. There are two sets of guidelines (described below) that apply to land use within management areas: standard and consultation.



### Figure 2-10. Historic Sites and Landmarks

Standard Guidelines. Some areas contain no known evidence of cultural resources. However, it is important to remember that the possibility of uncovering a previously unreported site always exists. Any activity that results in earthmoving must be reviewed prior to beginning to determine if a survey is needed. Field personnel should know the procedures for dealing with site discovery.

Consultation Guidelines. Most management areas contain at least one cultural resource site. Activities that include any form of earthmoving in these areas must be coordinated with the District Office prior to the start of such activity. No disturbance will be allowed if the activity adversely affects the cultural resource sites. Unevaluated sites that could be impacted will be evaluated to determine their eligibility for the NRHP. Sites that are not eligible for the NRHP can be modified in a manner consistent with land use classifications, resource management objectives, and environmental laws. However, they will be monitored in the event artifacts or features are uncovered that may be important for reevaluating the status of the site. Detailed guidance on land use is contained in the CRMP.

### **2.19.3. Protection of Cultural Resources**

A large percentage of cultural resource sites that are listed on the NRHP, potentially eligible for the NRHP, or unevaluated are being impacted by a variety of human activities. The Omaha District acknowledges the importance of these irreplaceable cultural resources and will take the necessary steps to monitor, reduce, or eliminate impacts before the sites are destroyed. Actions to be taken include:

- Allow no additional recreation development on cultural resource sites within existing recreation areas unless appropriate mitigation measures are implemented;
- Stabilize cultural resource sites being destroyed by shoreline erosion; and
- Monitor vandalism and erosion using volunteers to assist field personnel.

## **2.20. INTERPRETATION**

Lewis and Clark Lake/Gavins Point Dam features one of the two Omaha District Class “A” Regional Visitor Centers. It is one of only nine such facilities operated by the Corps of Engineers nationwide. The history and resources of the project area present an excellent opportunity for Federal, State, tribal, and local agencies to develop a cooperative interpretive program. The paleontological

resources, isolated biological communities, and human history are unique features that could be addressed in an interpretive program.

Historians have called the Lewis and Clark Expedition one of the most perfectly executed explorations of all time. For two years, four months, and nine days, Meriwether Lewis and William Clark led their group into the untamed reaches of the Louisiana Purchase, starting up the Missouri River in 1804 and returning to St. Louis in 1806. Their acclaimed journey took them through the heart of South Dakota where various historical markers tell of their exploits. Opportunities exist to improve and expand Lewis and Clark interpretive opportunities within the project area and at the Visitor's Center.

## **2.21. DEMOGRAPHIC CHARACTERISTICS**

### **2.21.1. Current Population Trends**

The demographic analysis will define two areas. The "Gavins Point" area consists of those counties adjacent to Lewis and Clark Lake and those areas downstream of Gavins Point Dam that are within Yankton County, SD and Cedar County, NE. The "tertiary" area will encompass the entirety of the States of South Dakota, Nebraska, and Iowa. Within these defined areas, three different socioeconomic-demographic environments are found: urban, rural, and American Indian Reservation. The Gavins Point area demographic analysis consists of two counties in South Dakota: Bon Homme and Yankton County; and two Nebraska counties: Cedar and Knox County.

#### Demographics

The three socioeconomic environments alluded to earlier - urban, rural, and American Indian Reservation -are each fully represented within the Lewis and Clark Lake area. Each is unique in its combination of socioeconomic characteristics. With the exception of Yankton County, the area is relatively rural. The Santee Reservation is located in Knox County, Nebraska.

According to 2000 census figures, the four Gavins Point area counties together contain 2,399 square miles and have a total population of 47,901 for a population density of 20.0 persons per square mile.

This represents a 4.1 percent increase from the 1990 population of 46,036 that had been a 7.6 percent decrease from the 1980 population of 49,843.

Yankton County, SD is 522 square miles in size, relatively urban, and has a population density of 41.5 persons per square mile. From 1980 to 1990 the population increased 1.6 percent from 18,952 to 19,252 and from 1990 to 2000 the population increased 12.5 percent from 19,252 to 21,652. In 2000, the population was 95.1 percent white, 1.6 percent American Indian, and 1.2 percent black. The 2000 Census reported that the median age in Yankton County was 37.0, the birth rate was 14.1 births/1,000 residents, and the death rate was 8.7 deaths/1,000 residents. The City of Yankton is the largest city in the Gavins Point area with a population of 13,528.

Bon Homme County, SD is 563 square miles in size, rural, and has a population density of 12.9 persons per square mile. From 1980 to 1990 the population decreased 12.0 percent from 8,059 to 7,089 and from 1990 to 2000 the population increased 2.4 percent from 7,089 to 7,260. In 2000, the population was 95.5 percent white, 3.0 percent American Indian, and 0.6 percent black. The 2000 Census reported that the median age in Bon Homme County was 40.3, the birth rate was 8.5 births/1,000 residents, and the death rate was 10.6 deaths/1,000 residents. The City of Tyndall is the largest city in Bon Homme County with a population of 1,239.

Knox County, NE is 1,108 square miles in size, rural, and has a population density of 8.5 persons per square mile. From 1980 to 1990 the population decreased 16.8 percent from 11,457 to 9,534 and from 1990 to 2000 the population decreased 1.7 percent from 9,534 to 9,374. In 2000, the population was 91.6 percent white, 7.1 percent American Indian, and 0.1 percent black. The 2000 Census reported that the median age in Knox County was 43.0, the birth rate was 13.4 births/1,000 residents, and the death rate was 15 deaths/1,000 residents. The City of Creighton is the largest city in Knox County with a population of 1,270.

The Santee Sioux Tribal Reservation is located in Knox County, NE. The reservation is 173 square miles in area and has a population of 878, yielding a population density of 5.1 persons per square mile. The population is 64.1 percent American Indian and 33.7 percent white. The median age is 27.4.

Cedar County, NE is 740 square miles in size, rural, and has a population density of 13.0 persons per square mile. From 1980 to 1990 the population decreased 10.9 percent from 11,375 to 10,131 and from 1990 to 2000 the population decreased 5.1 percent from 10,131 to 9,615. In 2000, the

population was 99.1 percent white, 0.2 percent American Indian, and 0.1 percent black. The 2000 Census reported that the median age in Cedar County was 38.8, the birth rate was 12.5 births/1,000 residents, and the death rate was 11.6 deaths/1,000 residents. The City of Hartington is the largest city in the Cedar County with a population of 1,640.

The 2000 Census reported that in Bon Homme County, South Dakota, of those 25 years old or older 79.0 percent were high school graduates and 15.3 percent had undergraduate degrees. In Yankton County, South Dakota, of those 25 years old or older 86.1 percent were high school graduates and 23.0 percent had undergraduate degrees. Reported educational attainment for the State of South Dakota was 84.6 percent high school graduates and 21.5 percent had undergraduate degrees. In Cedar County, Nebraska, of those 25 years old or older 83.5 percent were high school graduates and 13.0 percent had undergraduate degrees. In Knox County, Nebraska, of those 25 years old or older 82.0 percent were high school graduates and 14.4 percent had undergraduate degrees. Reported educational attainment for the State of Nebraska was 86.6 percent high school graduates and 23.7 percent had undergraduate degrees.

### Tertiary Area

The tertiary area demographic analysis consists of all counties in South Dakota, Nebraska, and Iowa. Included within this tertiary area is a primary area of influence (market area) identified in a 1980 study of visitation conducted by the consulting firm of Roy F. Weston, Inc., under contract with the COE. According to the study, Lewis and Clark Lake attracts 95 percent of its visitors from Nebraska (42.7 percent), South Dakota (40.7 percent), and Iowa (11.6 percent). A rank listing of counties of origin of visitors showed that 85.3 percent of the visitors to the project came from 34 counties; 11 percent in southwestern South Dakota, 19 percent in northeastern Nebraska, and 4 percent in western Iowa. The primary market area is shown in Figure 2-11.

In 2000, the 11 counties (Bon Homme, Charles Mix, Clay, Davison, Hutchinson, Lincoln, McCook, Minnehaha, Turner, Union, Yankton) from South Dakota within the primary market area had a population of 278,292, 36.8 percent of the population of South Dakota. The 19 Nebraska counties (Antelope, Boone, Burt, Cedar, Colfax, Cuming, Dakota, Dixon, Dodge, Douglas, Knox, Madison, Pierce, Platte, Sarpy, Stanton, Thurston, Washington, Wayne) within the primary market area had a population of 827,069, 48.3 percent of the population of Nebraska. The four Iowa counties (Pottawattamie, Plymouth, Sioux, Woodbury) within the primary market area had a population of 248,019, which contributed 8.5 percent of the population of Iowa. The total primary market area



population was 1,353,380 in 2000, an increase of 10.8 percent from the 1990 population of 1,221,969, which was an increase of 2.7 percent from the 1980 population of 1,190,256.

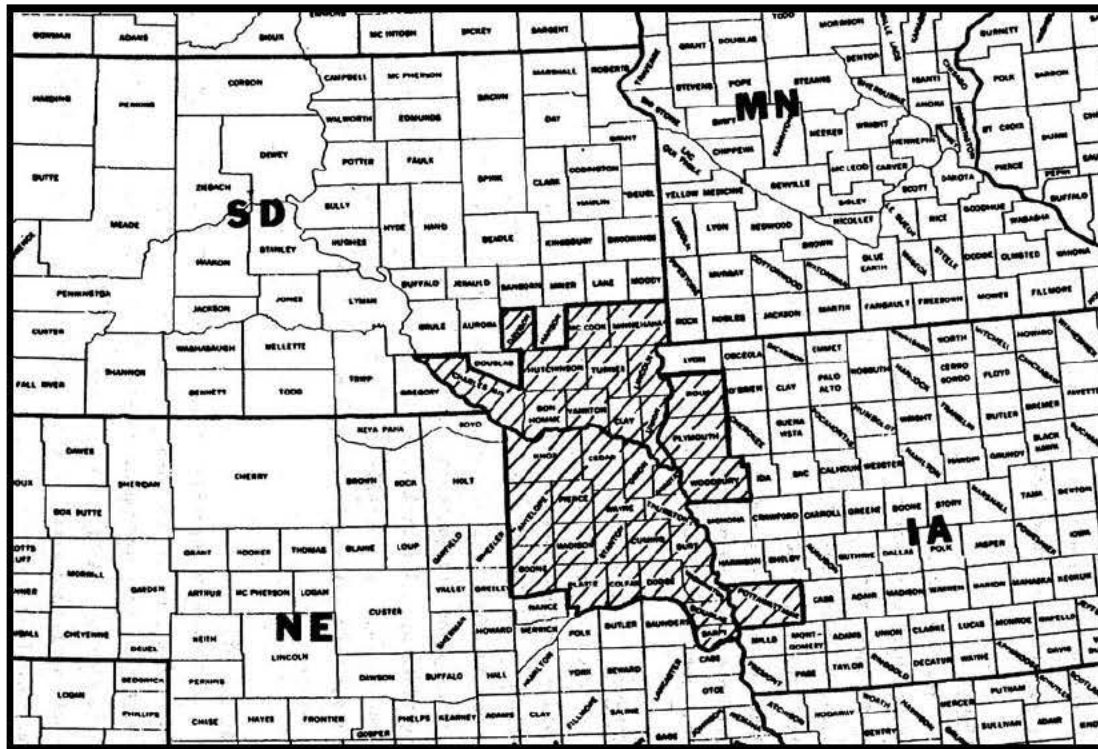


Figure 2-11. Area of Influence

The major cities in the primary market area are Omaha, Nebraska; Sioux City and Council Bluffs, Iowa; and Mitchell, Yankton, and Sioux Falls, South Dakota. According to the 2000 census, populations of Iowa, Nebraska, and South Dakota are 61.1, 69.7, and 51.9 percent urban, respectively.

Iowa is 55,869 square miles in area and in 2000 had a population density of 52.4 persons per square mile. From 1970 to 1980 the population of Iowa grew 3.1 percent from 2,825,368 to 2,913,808; from 1980 to 1990 the population decreased 4.7 percent from 2,913,808 to 2,776,755; and from 1990 to 2000 the population increased 5.4 percent from 2,776,755 to 2,926,324. In 2000, the population of Iowa was 93.9 percent white, 2.1 percent black, 0.3 percent American Indian, and 1.3 percent Asian. The 2000 Census reported that the median age of Iowa was 36.6, the birth rate was 12.8 births/1000 residents, and the death rate was 9.7 deaths/1000 residents. The educational attainment of the

residents of Iowa was reported as 86.1 percent high school graduates and 21.2 percent had undergraduate degrees.

Nebraska is 76,872 square miles in area and had a population density of 22.3 persons per square mile. From 1970 to 1980 the population of Nebraska increased 5.7 percent from 1,485,333 to 1,569,825; from 1980 to 1990 the population increased 0.5 percent from 1,569,825 to 1,578,385; and from 1990 to 2000 the population increased by 8.4 percent from 1,578,385 to 1,711,263. In 2000, the population of Nebraska was 89.6 percent white, 4.0 percent black, 0.9 percent American Indian, and 1.3 percent Asian. The 2000 Census reported that median age of Nebraska was 35.3, the birth rate was 14.1 births/1000 residents, and the death rate was 9.2 deaths/1000 residents. The educational attainment of the residents of Nebraska was reported as 86.6 percent high school graduates and 27.7 percent had undergraduate degrees.

South Dakota is 75,885 square miles in area and had a population density of 9.9 persons per square mile. From 1970 to 1980 the population increased 3.7 percent from 666,257 to 690,768; from 1980 to 1990 the population increased 0.8 percent from 690,768 to 696,004; and from 1990 to 2000 the population increased 8.5 percent from 696,004 to 754,844. In 2000, the population of South Dakota was 88.7 percent white, 0.6 percent black, 8.3 percent American Indian, and 0.6 percent Asian. The 2000 Census reported that median age of South Dakota was 35.6, the birth rate was 13.9 births/1000 residents, and the death rate was 9.4 deaths/1000 residents. The educational attainment of the residents of South Dakota was reported as 84.6 percent high school graduates and 21.5 percent had undergraduate degrees.

### **2.21.2. Demographic Effects On Visitation**

Increased outdoor recreation demands in the Gavins Point project area are anticipated. This expectation is based on the various demographic and economic indicators previously discussed in the profiles of the area of influence. The general conclusions and their applicability to recreation opportunities at Lewis and Clark Lake are presented below.

#### **Population**

Population in the Gavins Point area decreased 36.1 percent between 1980 and 2000. Decreases in population occurred in Cedar and Knox Counties, NE, and increases have occurred in Yankton and

Bon Homme Counties, SD. Although the population of the Gavins Point area has decreased, the primary market area grew 13.7 percent, and the populations of the surrounding States of Iowa, Nebraska, and South Dakota have increased 4.2 percent during the same time period.

According to the U.S. Census Bureau in its population projections (based on 2000 census data), from 2000 to 2025 the population of the three states is predicted to increase a total of 8.3 percent from 5,389,286 to 5,836,597. Specifically, South Dakota's population is projected to increase 14.7 percent from a 2000 population of 754,844 to approximately 866,000 in 2025; Nebraska's population is projected to increase 12.8 percent from a 2000 population of 1,711,263 to approximately 1,930,000 in 2025; and Iowa's population is projected to increase 4.0 percent from a 2000 population of 2,923,179 to 3,040,000 in 2025. The effect of these anticipated increases in population will be an increased demand for recreational opportunities.

### Age

Age is a major factor affecting both participation in and the amount of money spent on outdoor recreation, as shown in Table 2-16. Although the dollar amounts are dated somewhat, the relative spending pattern still exists.

As shown in the above-mentioned table, recreation involvement tends to decline steadily throughout adulthood; however, the amount of money spent on outdoor recreation does not. Persons 60 or older spent more than twice as much money per activity day than those in the 40-59 age group.

**Table 2-16. Outdoor Recreation Participation and Expenditures by Age Group, 1982-83**

| Age Group | Number of Activities | Activity Days per Year <sup>1</sup> | Yearly Expenditure | Expense Per Activity Day |
|-----------|----------------------|-------------------------------------|--------------------|--------------------------|
| 12-24     | 10                   | 60                                  | \$236              | 3.93                     |
| 25-39     | 8                    | 40                                  | \$375              | 9.38                     |
| 40-59     | 6                    | 27                                  | \$413              | 15.30                    |
| 60+       | 3                    | 12                                  | \$391              | 32.58                    |

<sup>1</sup> An activity day represents one visitor participating in a particular recreation activity one or more times at one or more areas of a project for any length of time during a 24-hour period.

Source: 1982-1983 Nationwide Recreation Survey, U.S. National Park Service.

Market Opinion Research conducted a study entitled "Participation in Outdoor Recreation Among American Adults and the Motivations Which Drive Participation" in May 1986 for the President's Commission on Americans Outdoors. This study concluded that a majority of American adults (18 and over) consider themselves "outdoors" people. Members of the "baby boom" generation, born between 1946 and 1961, are predominantly individuals with active outdoor lifestyles. Because they constitute such a large percentage of all adults, their interests greatly influence general trends. Although the eldest of the baby-boomers are at an age when participation in active outdoor sports begins to decline, more of them continue participating in outdoor recreation than the previous generation did at that age. In the future, elderly baby-boomers will probably place more demands on outdoor recreation facilities than those in older age groups do now.

### Income

Based on income, the residents in the areas of influence of the Gavins Point project might be expected to have slightly lower than average demands for the more costly forms of outdoor recreation such as camping, boating, and fishing. The per capita incomes of Iowa, Nebraska, and South Dakota in 2000 were 91.0, 95.3, and 87.2 percent of the U.S. average respectively.

### Education

Residents in the Gavins Point and tertiary areas would be expected to engage in outdoor recreation pursuits at levels comparable to the national average based on education. The 1982-83 NPS survey showed that participation in outdoor recreation rises with increasing levels of education. High school graduates spent over twice as many days on outdoor recreation activities as those who did not graduate from high school. College graduates spent over three times as many days on recreation activities compared to high school non-graduates.

The educational level attained by residents within the defined Gavins Point areas is comparable to that attained by residents of the United States as a whole. Of all adults at least 25 years of age in the states of Iowa, Nebraska, and South Dakota in 2000, 86.1 percent, 86.6 percent, and 84.6 percent, respectively, had completed high school compared to 84.1 percent in the United States as a whole. The percentage of the population who had an undergraduate degree in Iowa, Nebraska, and South Dakota was 21.2 percent, 27.7 percent, and 21.5 percent, respectively, compared with the U.S. average of 25.6 percent.

## 2.22. ECONOMIC CHARACTERISTICS

### Gavins Point Area

People are drawn to reside in urban areas for a variety of reasons - increased job opportunities, proximity of primary and long-term care facilities, availability and variety of commercial goods and services, and so forth. This motivation for migration to urban areas is displayed in the differences in labor statistics for the counties. Table 2-17 lists the average 2000 unemployment rates for the four Gavins Point area counties, in ascending order.

**Table 2-17. 2000 Average Unemployment Rates, Gavins Point Area**

| County                       | Percent Unemployment |
|------------------------------|----------------------|
| Yankton County, SD           | 1.8                  |
| Bon Homme County, SD         | 1.8                  |
| Cedar County, NE             | 2.8                  |
| Knox County, NE <sup>1</sup> | 4.2                  |

<sup>1</sup> Contains Santee Sioux Reservation

Yankton County contains the city of Yankton. Because of the large number of commercial and governmental enterprises available in this area, the opportunity for jobs is high. In contrast, Cedar and Knox Counties have no large towns and limited job opportunities, and therefore experience significantly higher unemployment rates.

According to the 2000 Census, 1998 total earnings in Bon Homme County equaled \$76.8 million. Total goods-related earnings accounted for 17.3 percent of 1998 total earnings, with 11.5 percent of total earnings coming from manufacturing. Farm earnings accounted for 22.3 percent of the total, retail trade 9.4 percent, services 16.4 percent, and government 19.3 percent. In the same year, per capita income was \$19,356 and median household income was \$28,703.

Total 1998 earnings in Yankton County equaled \$362.7 million. Manufacturing accounted for 23.6 percent of the total earnings, farm earnings 5.9 percent, retail trade 9.4 percent, finance, insurance and real estate 6.4 percent, services 23.5 percent, and government 15.0 percent. In the same year, per capita income was \$23,375 and median household income was \$32,997.

Total 1998 earnings in Cedar County were \$109.9 million. Manufacturing accounted for 8.5 percent of the total earnings, farm earnings 29.1 percent, retail trade 5.6 percent, services 14.1 percent, and government 17.9 percent. In the same year, per capita income was \$21,173 and median household income was \$33,078.

Total income for Knox County in 1998 was \$80.8 million. Farming accounted for 12.6 percent of the total income, retail trade 10.3 percent, finance, retail, and real estate, 3.7 percent, and government 29.4 percent. In the same year, per capita income was \$19,374 and median household income was \$26,711.

The two tables in this section show that employment prospects are more meager in the rural counties and even worse in the reservation counties. In addition to the employment problems arising from remoteness and inaccessibility, the reservations have a greater percentage of young people of an age to enter the workforce for the first time.

**Table 2-18. Persons Below Poverty Level**

| County                       | Percentage |
|------------------------------|------------|
| Bon Homme County, SD         | 13.7       |
| Yankton County, SD           | 11.8       |
| Cedar County, NE             | 9.1        |
| Knox County, NE <sup>1</sup> | 15.6       |

<sup>1</sup> Santee Sioux Reservation is with this county.

### Tertiary Area

In 2000, the per capita incomes of \$24,745 in Iowa and \$25,924 in Nebraska, and \$23,375 in South Dakota were 91.0, 95.3 and 87.2 percent respectively, of the average \$27,203 per capita income for all 50 States. In the same year 6.0 percent of all families in Iowa, 6.7 percent in Nebraska, and 9.3 percent had incomes below the poverty level, compared to 9.2 percent nationwide. On the other hand, unemployment rates have consistently been lower than the national average, and less given to extremes. In 2000, the U.S. annualized unemployment rate was 4.0 percent, while the Iowa rate was 2.6 percent, the Nebraska rate was 3.0, and the South Dakota rate was 2.3 percent.

Services (including those involving tourism), government, and agriculture are three primary sources of earnings for the inhabitants of Iowa, Nebraska, and South Dakota. Table 2-19 lists total contribution to personal income and percent of total, by source, for inhabitants of each State.

**Table 2-19. 2000 Personal Income by Source (Iowa, Nebraska, and South Dakota)**

| Earnings by Industry<br>(\$ thousands)  | Iowa       |         | Nebraska   |         | South Dakota |         |
|---|------------|---------|------------|---------|--------------|---------|
|   | Income     | Percent | Income     | Percent | Income       | Percent |
| Farming   | 2,289,2501 | 29.6    | 1,264,071  | 2.7     | 1,243,600    | 6.3     |
| Agricultural Services,<br>Forestry, Fisheries, &<br>other                       | 378,491    | 0.5     | 236,595    | 0.5     | 110,484      | 0.6     |
| Mining  | 102,440    | 0.1     | 94,488     | 0.2     | 52,636       | 0.3     |
| Construction  | 3,282,694  | 4.2     | 2,158,734  | 4.6     | 852,416      | 4.3     |
| Manufacturing   | 10,705,242 | 13.8    | 4,502,258  | 9.5     | 1,820,541    | 9.3     |
| Transportation & Public<br>Utilities  | 3,519,406  | 4.5     | 3,478,018  | 7.4     | 875,877      | 4.5     |
| Wholesale Trade   | 3,597,476  | 4.6     | 2,207,960  | 4.7     | 767,747      | 3.9     |
| Retail Trade  | 4,969,149  | 6.4     | 2,978,773  | 6.3     | 1,309,481    | 6.7     |
| Finance, Insurance, & Real<br>Estate  | 4,275,778  | 5.5     | 2,698,810  | 5.7     | 1,029,826    | 5.3     |
| Services  | 12,393,653 | 16.0    | 8,981,561  | 19.0    | 3,320,864    | 16.9    |
| Government  | 8,621,761  | 11.1    | 5,673,066  | 12.0    | 2,287,963    | 11.7    |
| Other Sources   |            |         |            |         |              |         |
| Dividends, Interest, &<br>Rent  | 15,615,681 | 20.2    | 9,947,195  | 21.0    | 4,387,895    | 22.4    |
| Transfer Payments   | 10,472,977 | 13.5    | 5,886,199  | 12.4    | 2,621,715    | 13.4    |
| Adjustments for<br>Contributions to Social<br>Insurance & Place of<br>Residence | -594,319   | -0.8    | -665,531   | -1.4    | -232,387     | -1.2    |
| Total   | 77,378,164 | 100     | 47,318,704 | 100     | 19,611,489   | 100     |

## **2.23. RECREATION FACILITIES**

Recreation facilities at Lewis and Clark Lake vary from well-developed campgrounds to primitive areas with few facilities. The existing recreation facilities at the various areas of the project are listed in Table 2-20 and Table 2-21.

In accordance with the Land and Water Conservation Fund Act of 1965, the Corps is required to charge a recreation user fee for the use of facilities and services at campgrounds and group camp areas managed by the Corps. The revenue from the user fee program is to sustain the operation and maintenance of the recreation facilities. However, in accordance with Public Law 96-154 (94 Stat. 2960), the revenue on or after 13 December 1980 will be returned to the U.S. Treasury to be available for appropriation for any or all purposes authorized by the Land and Water Conservation Fund (LWCF) Act without regard to the source of such revenue.

Despite the fact that all revenue is not returned directly to the project at which it is generated, a portion does return to the Omaha District in the form of Special Recreation User Fees (SRUF). The Omaha District, in turn, uses SRUF funding to lower recreation area operation and maintenance costs at various projects within the District, including Lewis and Clark Lake.



Table 2-20. Existing Corps Recreation Facilities, Part 1\*

| Recreation Area                     | Managing Agency <sup>1</sup> | Land Use <sup>2</sup> | Boat Ramp | Toilet | Potable Water | Picnic Sites | Group Shelter | Play ground | Camp Pads | Elect Hookups | Dump Station | Showers |
|-------------------------------------|------------------------------|-----------------------|-----------|--------|---------------|--------------|---------------|-------------|-----------|---------------|--------------|---------|
| 10. Charley Creek                   | COE                          | W                     | X         |        |               |              |               |             |           |               |              |         |
| 11. Charley Creek to Twin Bridges   | COE                          | W                     | X         |        |               |              |               |             |           |               |              |         |
| 18. Emanuel Creek                   | COE                          | W                     | X         |        |               |              |               |             |           |               |              |         |
| 20. Running Water <sup>4</sup>      | SDGFP                        | L                     | X         | X      |               |              |               |             |           |               |              |         |
| 24. Niobrara Rec Area               | NIO/NGPC                     | I                     | X         | X      |               |              |               |             |           |               |              |         |
| 26. Bazille Creek WMA <sup>3</sup>  | NGPC                         | W                     | X         |        |               |              |               |             |           |               |              |         |
| 29. Santee Lake Access Area         | SST                          | L                     | X         |        |               |              |               |             |           |               |              |         |
| 32. Devils Nest West                | COE                          | L                     | X         |        |               | X            |               |             |           |               |              |         |
| 35. Miller Creek Rec Area           | NGPC                         | I                     | X         | X      | X             | X            | X             | X           |           |               |              |         |
| 37. Bloomfield Rec Area             | NGPC                         | I                     | X         | X      | X             | X            |               | X           | X         | X             |              |         |
| 40. Burbach Rec Area                | NGPC                         | I                     |           | X      | X             | X            |               |             | X         |               |              | X       |
| 40. Weigand Rec Area                | NGPC                         | I                     | X         | X      | X             | X            |               | X           | X         | X             |              | X       |
| 43. Deep Water                      | NGPC                         | L                     |           | X      |               | X            |               |             |           |               |              |         |
| 45. Hideaway Acres Marina           | HAA                          | I                     | X         |        |               |              |               |             |           |               |              |         |
| 46. South Shore WMA                 | COE                          | L                     |           |        |               |              |               |             |           |               |              |         |
| 48. South Shore                     | NGPC                         | L                     | X         | X      |               | X            |               |             |           |               |              |         |
| 49. Crofton Golf Course             | CFT                          | I                     |           | X      |               |              |               |             |           |               |              |         |
| 51. Overlook Unit                   | COE                          | I                     |           | X      | X             | X            | X             | X           |           |               |              |         |
| 51. Tailwaters Unit                 | COE                          | I                     | X         | X      | X             | X            |               | X           | X         | X             | X            | X       |
| 57. Training Dike Unit              | COE                          | I                     | X         | X      | X             | X            | X             | X           |           |               |              |         |
| 59. Cottonwood Unit                 | COE                          | I                     | X         | X      | X             |              | X             | X           | X         | X             |              | X       |
| 58. Pierson Ranch Unit <sup>4</sup> | COE                          | I                     |           | X      | X             | X            | X             | X           | X         | X             | X            | X       |

<sup>1/</sup> SDGFP – South Dakota Department of Game, Fish, and Parks  
COE – Corps of Engineers  
NGPC – Nebraska Game and Parks Commission  
SST – Santee Sioux Tribe  
HAA – Hideaway Acres Association

CFT – City of Crofton  
NIO – Village of Niobrara  
<sup>2/</sup> I – Operations: Recreation – Intensive Use  
L – Operations: Recreation – Low-Density Use  
W – Wildlife Management

<sup>3/</sup> WMA – Wildlife Management Unit  
<sup>4/</sup> Leased in perpetuity to SDGFP per Title VI

\* For transferred recreation areas or for leases in perpetuity see Table 1-1.

**Table 2-21. Existing Corps Recreation Facilities, Part 2**

| Recreation Area                     | Swimming | Marina | Concession | Golf | Trail | Change House | Rental Units | Amphitheater | Multi Purpose Courts | Ball Fields | Visitor Center or Booth |
|-------------------------------------|----------|--------|------------|------|-------|--------------|--------------|--------------|----------------------|-------------|-------------------------|
| 10. Charley Creek                   |          |        |            |      |       |              |              |              |                      |             |                         |
| 11. Charley Creek to Twin Bridges   |          |        |            |      |       |              |              |              |                      |             |                         |
| 18. Emanuel Creek                   |          |        |            |      |       |              |              |              |                      |             |                         |
| 20. Running Water <sup>1</sup>      |          |        |            |      |       |              |              |              |                      |             |                         |
| 24. Niobrara Rec Area               |          |        |            | X    |       |              |              |              |                      |             |                         |
| 26. Bazille Creek WMA               |          |        |            |      |       |              |              |              |                      |             |                         |
| 29. Santee Lake Access Area         |          |        |            |      |       |              |              |              |                      |             |                         |
| 32. Devils Nest West                |          |        |            |      |       |              |              |              |                      |             |                         |
| 35. Miller Creek Rec Area           |          |        |            |      |       |              |              |              |                      |             |                         |
| 37. Bloomfield Rec Area             |          |        |            |      |       |              |              |              |                      |             |                         |
| 40. Burbach Rec Area                | X        |        |            |      |       | X            |              |              |                      |             |                         |
| 40. Weigand Rec Area                | X        | X      | X          |      |       | X            | X            |              |                      |             |                         |
| 43. Deep Water                      |          |        |            |      |       |              |              |              |                      |             |                         |
| 45. Hideaway Acres Marina           |          | X      |            |      |       |              |              |              |                      |             |                         |
| 46. South Shore WMA                 |          |        |            |      |       |              |              |              |                      |             |                         |
| 48. South Shore                     |          |        |            |      |       |              |              |              |                      |             |                         |
| 49. Crofton Golf Course             |          |        |            | X    |       |              |              |              |                      |             |                         |
| 51. Overlook Unit                   |          |        |            |      |       |              |              |              |                      |             | X                       |
| 51. Tailwaters Unit                 |          |        |            |      |       |              |              |              |                      |             |                         |
| 57. Training Dike Unit              | X        |        |            |      |       | X            |              |              |                      |             |                         |
| 59. Cottonwood Unit                 |          |        |            |      |       |              |              |              |                      |             |                         |
| 58. Pierson Ranch Unit <sup>1</sup> |          |        |            |      | X     |              |              |              | X                    | X           | X                       |

<sup>1</sup>/ Leased in perpetuity to SDGFP per Title VI

## **2.24. RECREATION ACTIVITIES AND NEEDS**

Both South Dakota and Nebraska have an abundance of natural, cultural, and scenic resources. Because of these resources, recreation is an important part of the future of these two states. The relatively high rates of participation in fishing, hunting, and a wide variety of other outdoor activities demonstrate the importance of outdoor recreation. However, both states recognize the need to seek a balance between use and protection of these vital resources.

A wide assortment of resources, facilities, and programs provide diverse and quality outdoor-recreation opportunities for residents and tourists. Approximately 30 percent of the visitors to Lewis and Clark Lake in 2002 engaged in water-based recreation activities as identified by the activity mix present later in this chapter. In addition, the remaining visitors participate in land-based recreation activities that are enhanced by the proximity of the lake.

### **2.24.1. Fishing**

According to the South Dakota and Nebraska 2001 Missouri River Creel Report about 69 percent of the fishermen, when taking all their experiences into account, reported that they were satisfied with their fishing trip at Gavins Point Project. However, only about 50 percent rated their experience as fair to excellent when considering only the types of fish caught and the number of fish caught. In a 2000 study fifteen percent of the project's 8.7 million visitors participated in fishing.

The 2001 study estimates that from April through September about 156,700 hours of fishing pressure occurred from the mouth of Bazile Creek to Gavins Point Dam, and about 81,000 hours occurred in the tailwater area.

The estimated fish harvest in 2001 for April through September from the mouth of Bazile Creek to Gavins Point Dam was 46,543. In this area walleye accounted for about 61.1% of the harvest, channel catfish 27.2%, large mouth bass 4.4%, small mouth bass 1.2%, northern pike 1.9%, and other (sauger, freshwater drum, white bass, black crappie, white crappie, rock bass, common carp, and flathead catfish) 4.2%.

The estimated fish harvest in 2001 for April through September in the tailwater area was 26,097. In this area walleye accounted for about 5.3% of the harvest, freshwater drum 51.3%, channel

catfish 18.0%, sauger 2.5%, small mouth bass 2.5%, white bass 2.9%, and other (bighead carp, bigmouth buffalo, black crappie, common carp, flathead catfish, goldeye, northern pike, river carpsucker, shorthead redhorse, smallmouth buffalo, and yellow perch) 17.5%.

In the last fifteen years three Bass Masters fishing tournaments have taken place on the lake with another tournament planned for 2004.

Generally, in December the number of people fishing drops off dramatically, but the decline is dependent on weather conditions. Fishing activities have not been surveyed during the winter months. Fishing by hook and line, archery, snagging, surface spearing, and underwater spearing is governed by special limits, seasons, and locations. Fishermen must refer to the individual State regulations. Fishermen have several concerns: an inadequate number of boat ramps to accommodate periodic heavy use, the maintenance of a high level of water quality, and the need for the development of a thriving fishery.

#### **2.24.2. Hunting and Trapping**

Hunting and trapping are recreational traditions in the northern Great Plains. The participants are primarily males over 18 years of age. Public hunting lands cannot support the hunting pressure alone; therefore, a high percentage of hunting occurs on private land. Public hunting lands are a very important resource, particularly with the closure of many private hunting lands. At Gavins Point the Corps plants over 40 acres of wildlife food plots each season in areas open to public hunting. Hunting, trapping, and the use of firearms may be permitted or prohibited depending on the area, the time of the year, and certain other conditions. State hunting and trapping regulations should be consulted.

Because of its location in the Central Flyway, the migration route for hundreds of thousands of geese and ducks, the Gavins Point project has excellent waterfowl hunting. The waterfowl season runs from October into December and brings in many out-of-state hunters. During this period, most (over 95 percent) of the Lewis and Clark Lake hunters are found in the area between Snatch Creek and Niobrara. About 110 duck blind permits are given out each year.

The primary big game species is whitetail deer and the most popular game birds, besides waterfowl, are ring-necked pheasant and turkey.

### **2.24.3. Camping**

Campgrounds around Lewis and Clark Lake are available for all levels of camping and provide a variety of facilities. The Statewide Comprehensive Outdoor Recreation Plan (SCORP) indicates a shortage of camping facilities pads in planning districts in both states. There is also an indicated need at Lewis and Clark Lake for camp pads with electricity. This category is not inventoried separately, but these camp pads are consistently in demand and in short supply. The extension of electricity to existing camp pads is planned or proposed for camping areas in both states. New camp pads with electrical hookups are being developed in areas managed by the SDGFP.

Camping is a popular and important activity in South Dakota and Nebraska. Campgrounds around Lewis and Clark Lake are available for all levels of camping and provide a variety of facilities. On high-use weekends, these campgrounds are often near capacity. As a high resource-oriented activity, primitive camping takes place most often in areas where large amounts of undeveloped public land are available. Most of the primitive camping at the lake is associated with hunting and fishing trips. In spite of the current available facilities, there is a demand for improved facilities at various recreation areas around the lake.

Primitive camping may be associated with hunting and fishing trips away from home, but there are a number of individuals who actively seek a primitive camping experience to enjoy solitude and nature or who want an alternative to the campground environment. These recreationists are not very visible, vocal, or easily identified. Therefore, their needs are sometimes overlooked.

### **2.24.4. Boating**

A need for boat ramps still exists in South Dakota Planning District 3. To meet this need the first consideration should be the rehabilitation of existing ramps. When new construction is necessary, adaptations should be made to reduce costly maintenance such as dredging. In some areas the level of demand requires that existing boat ramps be enlarged or improved to accommodate larger, heavier boats. This is especially important in areas where potential new sites are not readily available. The increased popularity of larger boats that are designed to remain in the water during the entire recreation season is creating a need for additional marina space and consequently a need for additional off-season boat storage. This situation exists at the Yankton Marina and will probably occur at the Weigand Marina in the near future.

Visitors to Lewis and Clark can enjoy a variety of boating experiences including water skiing, pleasure boating, sailboating, pontooning, and canoeing.

Participation in sailing is relatively low in Nebraska and South Dakota overall, but it is very high at Lewis and Clark Lake. The number of participants has been growing steadily, and evidence suggests that this trend will continue. In 1982 there were 182 boat slips in the Yankton Marina. By 1987 there were 330 slips and a need for additional ones. The excellent facilities available at the Yankton Marina have contributed to the increased number of large boats on the lake. During the last few years, small sailing craft (under 20 feet) have been using the lake for fleet races, and the number of participating fleets continues to rise. Indications are that the Midwest is becoming a center for this sport. A small-craft storage facility currently exists in the Yankton Unit, but an increase in sailing participation has led to a need for a larger storage area. Sailboarding is also increasing in popularity, partially because of a lower participation cost. The only facility needed for small-craft sailing and sailboarding participants is a beach for launching and recovering the crafts. There is a beach adjacent to the small-craft storage area in the Yankton Unit that is used for this purpose.

Canoeing is concentrated in the upper third of Lewis and Clark Lake, particularly in the marshes. Existing launching and recovery sites meet the basic needs of the small number who participate in this activity at the lake. According to South Dakota's 2000 SCORP the Southeast Region accounts for 75% of canoe trips.

Although a dedicated ski beach is not an essential facility for water skiing, its existence would add convenience, enjoyment, and safety. Where there is a high potential for conflict between swimmers and sailboaters or water-skiers, a dedicated ski beach should be provided. Water allocations are not needed at this time; however, if visitation increases and participation in water sports increases, then lake zoning may be needed in the future.

#### **2.24.5. Trail Activities**

Recreation trails have emerged as one of the most popular outdoor recreation facilities in South Dakota and Nebraska. The wide variety of activities that the trails compliment contributes to their popularity. Walking, jogging, hiking, bicycling, and cross-country skiing are common activities. The trail activities can be done alone or in groups for pleasure or transportation.

Nature Trails. There is a need for hiking trails in both Nebraska and South Dakota and these trails should be a priority item. The only existing hiking trails are the 1-mile Smutty Bear interpretive trail located in the Gavins Point Unit, an interpretive trail in the Chief White Crane Unit, the Calumet Bluff Hiking Trail located near the visitor center, and the 4.75-mile hiking/biking trail from the Gavins Point Unit through the Pierson Ranch Unit. Other locations identified for trail development are West South Shore and Bloomfield in Nebraska. An extension of the Smutty Bear Trail to other areas of the Gavins Point Unit and possibly into the Lesterville area in South Dakota was also suggested. The January 1982 NPS plan for the Lewis and Clark National Historic Trail recommends development of a hiking trail from the Yankton Unit to Running Water.

Lewis and Clark Trail. The U.S. Corps of Discovery, better known as the Lewis and Clark Expedition of 1804-06, was instrumental in the eventual settlement of both Nebraska and South Dakota. Expedition events and discoveries in the project area are getting more numerous as the 200-year anniversary approaches.

Horseback Riding. There is one 6-mile equestrian trail that originates in the Gavins Point Unit. This groomed trail and base camp has received very limited use in the past. However, the South Dakota SCORP identifies the Southeast region as accounting for 49% of all horseback-riding occasions. Opportunities for additional trails should be investigated to determine if current use justifies additional facilities. If the existing equestrian trail still has limited use, consideration might be given for combining its use with other types of non-motorized trail uses; for example, mountain bikes or hikers looking for longer trails. The Nebraska SCORP indicates a need for additional equestrian trails but none are recommended for the NGPC-managed areas because horseback riding facilities are provided at the new Niobrara State Park adjacent to the Gavins Point project.

#### **2.24.6. Picnicking**

Adequate picnic facilities are generally available, but there are areas of local need. The State of South Dakota shows the southeast region's percent of total occasions exceeded the percent of facilities located in the region. The creation of new picnic areas and the augmentation of existing ones with facilities such as shelters, playgrounds, and potable water are recommended in this Master Plan for recreation areas in both Nebraska and South Dakota.

Picnic facilities are available at most of the recreation areas. Overall, the picnic facilities appear to be adequate, but there are some individual areas requiring additional facilities. The creation of new picnic areas and the upgrading of existing ones with facilities such as shelters, playgrounds, and potable water are recommended.

#### **2.24.7. Sightseeing**

The beauty of the surrounding area makes Lewis and Clark Lake attractive to sightseers. This project provides habitat for numerous prairie and wetland bird species. Woody vegetation indigenous to both the eastern and the western U.S. may be found along creek drainages or woody draws.

A number of areas around the lake offer photographers the opportunity for scenic and wildlife photography. The wetland areas and embayments, waterfowl areas, and the stark rangeland afford the chance to photograph many inviting vistas. Bald eagles, ducks, and geese migrate through the project area on their way to and from breeding grounds in Canada. In addition, many opportunities exist for photographing big game species or fishing catches.

Although many of the visitors to the lake participate in sightseeing, many do so as secondary or tertiary activities. The peace, solitude, and beauty of the area are attractive to numerous sightseers.

#### **2.24.8. Swimming**

Beach swimming is one of the most popular activities at Lewis and Clark Lake. Designated swimming areas, marked with buoys, are located in several of the high-density recreation areas. In other areas around the lake many visitors swim and sunbathe along the shoreline in undesignated locations. Maintaining a "sand" beach is a yearly effort for all park and project personnel because normal reservoir operation and wave action on the lake frequently wash the sand away or cover it up with deposits of silt. Water quality is always a concern, and this must be monitored regularly to assure public health and safety.

#### **2.24.9. Bicycling**

Bicycling is a popular and rapidly growing recreation activity. The 4.75-mile hiking/biking trail



from the Gavins Point Unit to Yankton attracts much use. Quality bike trails are important to many recreationists and may have the potential to attract tourists to an area. A new form of participation, off-road or mountain biking, is undergoing tremendous growth nationally. There has been little experience in managing a recreation area for this nontraditional use of resources, and there is concern about potential impacts from this "new" activity. Erosion has been a problem in other areas of the United States where mountain biking has become popular. If trails are to be shared by hikers and bikers, then special design considerations are essential for safety--the avoidance of blind corners and steep hills, for example. Mountain biking may require trails dedicated specifically for that use. Given current trends this activity should be given a higher priority than past development efforts recognized.

#### **2.24.10. Archery**

Archery is a growing sport, as evidenced by well-organized archery clubs in the vicinity of the lake that have requested an archery range suitable for conducting local, State, regional, and national tournaments. A site in the Gavins Point Unit has been designated for this activity. If additional need develops, there are other areas suitable for this type of development on both shores. In South Dakota the defunct Springfield Recreation Area archery range could be renovated. In Nebraska there are suitable areas at Weigand, Bloomfield, and Niobrara Recreation Areas that could be developed.

#### **2.24.11. Cross-Country Skiing**

Although not a new sport, cross-country skiing has become popular only recently in South Dakota and Nebraska. Participation continues to increase. Because special facilities are not required, this activity can occur in many of the recreation areas under existing conditions. The area to the west of the Gavins Point Unit entry road is available for winter use, with 2.8 miles of signed and groomed ski trails. The 6-mile equestrian trail in the Gavins Point Unit is also available for cross-country ski enthusiasts. Cross-country skiing is proposed by the City of Crofton as an off-season use of the Lakeview Golf Course.

### **2.24.12. Snowmobiling**

The sport of snowmobiling has evolved away from the use of large tracts of lands toward the use of trails for extended riding. The area east of the Gavins Point Unit entry road, through the Midway and Yankton Units to the face of the dam, is open to snowmobiling. This area is connected by a 40-mile signed and groomed trail to other popular snowmobile routes such as along South Dakota Highway 81 to the James River and the town of Utica. Based on current and projected levels of participation, the trail needs for this sport have been met. The Weigand Recreation Area is suggested as a Nebraska area that could accommodate this winter activity.

### **2.24.13. Ice Skating, Ice Fishing, Ice Sailing, and Sledding**

These winter activities occur during periods of snow cover and the 4-month winter ice cover on Lewis and Clark Lake. Ice fishing and ice skating require virtually no developed facilities and occur without the formal involvement of recreation area providers. South Dakota's SCORP reports that winter activities are quite popular, however, given the travel times reported in the survey ice skating and sledding are done on a local basis. There is no information on the popularity of ice fishing and ice sailing.

### **2.24.14. Tennis and Similar Activities**

Tennis courts are normally provided by municipalities, but tennis courts and multipurpose courts were developed by the COE at Pierson Ranch. Similar facilities, including horseshoe pits, ball fields, Frisbee courses, and so forth, could be developed to serve the needs of day users or campers at areas managed by the NGPC, SDGFP, or COE.

## **2.25. VISITATION PROFILE - TRENDS AND DEMANDS**

Each of the Missouri River main stem reservoirs has amenities for visitors. At Lewis and Clark Lake, the varying topography, the fishery and hunting resources, and the recreation facility development combine to make the Gavins Point Dam/Lewis and Clark Lake project important to the central Great Plains. Because the project is located between two states, it provides easy access for both South

Dakota and Nebraska residents and visitors. All of these components contribute to the visitation patterns observed at the project.

### 2.25.1. Project Visitation

Table 2-22 shows the annual visitation to the Gavins Point Project from 1995 through 2000. As can be seen, the 2000 visitation for the Gavins Point project was 8,756,400 visitor-hours. Visitation to designated recreation areas accounted for approximately 7,717,400 visitor-hours or roughly 88.1 percent. The remaining 11.9 percent of the visitation is the estimated amount of dispersed recreational use. (Dispersed use is that type of recreation that occurs in those parts of the project that are not designated recreation areas). Visitation to the project has remained steady over this time period.

**Table 2-22. Annual Visitation Gavins Point Project**

| Year | Visitor-Hours <sup>1</sup> |
|------|----------------------------|
| 1995 | 9,135,900                  |
| 1996 | 9,339,500                  |
| 1997 | 8,722,700                  |
| 1998 | 9,036,100                  |
| 1999 | 8,930,600                  |
| 2000 | 8,756,400                  |

<sup>1</sup> Rounded to the nearest hundred.

When compared to other lakes on the Missouri River main stem, Lewis and Clark Lake, although having the least number of shoreline miles, recorded the fourth highest number of visitor hours for 2000 (Table 2-23). Visitation at Lewis and Clark Lake accounted for 14 percent of the total visitation to the main stem projects. Visitor hours per shoreline mile at Lewis and Clark Lake was four times greater than at any other main stem project, indicating a high density of use at this project.

**Table 2-23. Main Stem Visitation during 2000**

| <b>Project</b> | <b>V-Hours<sup>1,2</sup></b> | <b>% Total V-hours</b> | <b>Miles of Shoreline</b> | <b>V-Hour Per Shoreline Mile</b> |
|----------------|------------------------------|------------------------|---------------------------|----------------------------------|
| Gavins Point   | 8,756,400                    | 14.0                   | 90                        | 97,300                           |
| Garrison       | 16,555,900                   | 27.0                   | 1,300                     | 12,400                           |
| Oahe           | 14,623,200                   | 24.0                   | 2,250                     | 6,500                            |
| Big Bend       | 5,261,800                    | 9.0                    | 200                       | 26,300                           |
| Fort Randall   | 9,752,300                    | 16.0                   | 540                       | 18,100                           |
| Fort Peck      | 5,946,100                    | 10.0                   | 1,520                     | 3,900                            |

<sup>1</sup> V-hours = Visitor-hours.

<sup>2</sup> Rounded to nearest hundred.

### 2.25.2. Visitation Surveys

The most recent recreation use survey at Gavins Point/Lewis and Clark Lake was conducted during the summer of 1992. Survey questions were divided into two specific types - those pertaining to the Gavins Point Dam/Lewis and Clark Lake project as a whole and those pertaining to specific recreation areas. The survey information not only reveals place of residence and destination of visitors but also the average length of stay, the average number of visitors per vehicle, and the specific type of recreation activity in which visitors participated.

The outlook for future visitation at Lewis and Clark Lake as a whole, including not only Corps-managed recreation areas but those managed by the States of Nebraska and South Dakota is one of increasing demands by the public on a limited resource. The South Dakota Department of Game, Fish, and Parks has completed a Master Plan for the development of the Yankton, Midway, and Gavins Point Units of the state recreation area which reflects these anticipated demands for recreation opportunities in the Yankton area.

### **2.25.3. Visitor Distribution**

Approximately 80 percent of the project visitation occurred in the areas near or adjacent to the dam. Fifty-seven percent of visitation occurred in four areas, all in South Dakota, in this portion of the project area. In the recorded visitation hours for 2000 18 percent of visitation occurred in Nebraska, with the majority of this occurring at the Tailwaters, Overlook, and South Shore Areas.

### **2.25.4. Carrying Capacity**

Carrying capacity is a concept that denotes the limit of use for some particular purpose. For example, a pasture will support (carry) a definable number of animals for a given time without suffering damage sufficient to reduce future capacity. Similarly, the concept of carrying capacity can be applied to recreation in a given area to help assess the relative quality of the recreational experience.

The recreational carrying capacity of a given area is considered to have two main components: "social" capacity and "resource" capacity. Social capacity is the level of use density beyond which the user does not experience a reasonable level of satisfaction. For example, the social capacity of a given area is typically much greater for a swimming beach than for a golf course.

Resource capacity is the level of use beyond which irreversible environmental deterioration takes place or degradation of the resource makes it unsuitable or unattractive for recreational use. Resource capacity is usually a seasonal or long-term issue, as most areas will tolerate some short-term overuse without substantial adverse effects. The maximum load established by whichever factor is more constraining is considered the carrying capacity.

The carrying capacity of an area is dependent on (1) the extent to which the environmental resource base of that area lends itself to recreation development and (2) the type and extent of recreation facilities that are developed. Because recreation facilities have been developed on much or all of the land in a recreation area allocated for Operations: Recreation - Intensive Use, areas in this allocation have the highest per-acre carrying capacities. However, if visitation in the Intensive Use areas regularly exceeds carrying capacity, more recreation development in the Low-Density Use areas is warranted where location and the resource base are conducive to increased visitation. Depending on the scale of development, a change in allocation may be

appropriate. Conversely, sometimes changes in the resource base or level of visitation result in inefficient use, degradation of resources, or problems with maintenance. In that case, consideration should be given to closing certain facilities in that area and/or changing its allocation; carrying capacity would be correspondingly reduced.

The social capacity at Lewis and Clark Lake is often limited by the level of recreational facility development, such as parking spaces and restrooms, or by the expectations of the different recreational users. The density of the existing facilities at the lake occasionally approach social capacity limits in some of the recreation areas. For example, the Chief White Crane campground has an average occupancy on the weekends during June, July, and August of 87 percent. The sites with higher carrying capacity and accessibility are ordinarily classified as "Recreation" or "Project Operations" lands. Areas where additional facilities are needed are primarily in the vicinity of the dam.

The resource capacity of the Gavins Point Dam/Lewis and Clark Lake project is typically controlled by factors such as the presence of nesting sites, highly erodible soils, or steep terrain. Resource capacity must be accommodated in the design and location of facilities, as well as the regulation of use. Areas with low resource capacity are classified as "Environmentally Sensitive," "Wildlife Management," or "Multiple Resource Management" lands.

Detailed information on the resource base is being obtained and mapped as part of the Operational Management Plan (OMP) process. As improved visitation and user information is obtained through surveys, the data can be combined with the OMP resource data to determine specific improvements at those areas with the highest visitation and for those sites that may be used more extensively in the future.

**Table 2-24. 2000 Visitation to Lewis and Clark Lake Recreation Areas**

| <b>Recreation Area</b>     | <b>2000 Visitor- Hours <sup>1</sup></b> | <b>Percent of Total Visitation</b> |
|----------------------------|---|------------------------------------|
| S.D. State Recreation Area | 1,262,400                               | 16                                 |
| S.D. State Recreation Area | 1,439,700                               | 19                                 |
| S.D. State Recreation Area | 495,500                                 | 6                                  |
| Tabor                      | 37,000                                  | 0                                  |
| Sand Creek                 | 73,600                                  | 1                                  |
| Springfield                | 125,000                                 | 2                                  |
| Pierson Ranch Campground   | 392,000                                 | 5                                  |
| Chief White Crane          | 928,000                                 | 12                                 |
| Cottonwood Campground      | 804,000                                 | 10                                 |

| Recreation Area       | 2000 Visitor- Hours <sup>1</sup> | Percent of Total Visitation |
|-----------------------|----------------------------------|-----------------------------|
| Training Dike         | 525,300                          | 7                           |
| Nebraska Tailwaters   | 324,200                          | 4                           |
| Overlook              | 127,000                          | 2                           |
| South Shore           | 47,800                           | 1                           |
| Weigand/Burback       | 386,300                          | 5                           |
| Bloomfield            | 224,900                          | 3                           |
| Miller Creek          | 74,900                           | 1                           |
| Santee                | 121,800                          | 2                           |
| Running Water         | 20,700                           | 0                           |
| Niobrara              | 24,100                           | 0                           |
| Power Plant           | 9,500                            | 0                           |
| Boy Scout Camp        | 3,500                            | 0                           |
| Play House            | 2,700                            | 0                           |
| Hiking Trail Road     | 74,300                           | 1                           |
| Pierson Ranch Day Use | 75,000                           | 1                           |
| Cottonwood Day Use    | 42,600                           | 1                           |
| Fish and Wildlife     | 75,000                           | 1                           |
| <b>TOTAL</b>          | <b>7,717,400</b>                 | <b>100</b>                  |

<sup>1</sup> Rounded to the nearest hundred.

### 2.25.5. Activity Mix

The relative frequency of participation in various activities at the Gavins Point Dam/Lewis and Clark Lake project is estimated each year. The annual activity mix is presented in Table 2-25. The total is greater than 100 percent because many people participated in more than one activity at a given recreation area.

**Table 2-25. Activity Mix, Lewis and Clark Lake**

| Activity     | Annual Participation Rate (percent) |
|--------------|-------------------------------------|
| Camping      | 7                                   |
| Picnicking   | 5                                   |
| Boating      | 10                                  |
| Fishing      | 15                                  |
| Hunting      | 2                                   |
| Water-skiing | 2                                   |
| Swimming     | 10                                  |
| Sightseeing  | 53                                  |
| Winter       | 0                                   |
| Other        | 23                                  |
| <b>Total</b> | <b>127</b>                          |

### **2.25.6. Recreation Demand**

The South Dakota Department of Game, Fish, and Parks (SDGFP) and the Nebraska Game and Parks Commission (NGPC) have compiled State Comprehensive Outdoor Recreation Plans (SCORPs). These documents identify the recreation needs and desires of state residents and recommends actions to meet those needs.

The State of South Dakota is divided into three Planning and Development Regions. Lewis and Clark Lake is located in the Southeast Planning and Development Region. This region includes the population centers of Mitchell, Sioux Falls, Yankton, and Vermillion; the Fort Randall and Gavins Point projects; and the Missouri River downstream of Gavins to the borders of Iowa, Nebraska, and South Dakota.

Information on the various facilities needed in the Southeast region was gathered through a series of questionnaires sent by the SDGFP to various Federal, State, and local agencies as well as county and tribal governments. As part of the inventory, agencies and communities were asked to identify what condition their facilities were in and whether addition facilities were needed.

The project area falls within Nebraska's planning region 3 which covers the 16 northeastern counties. About 12 percent of the state's population lives here according to the Nebraska SCORP. The area is also home to only 2.5 percent of the state's non-urban public recreation lands. The population's demand for recreational facilities exceeds the available opportunities as the figures above indicate.

Nebraska has identified additional access sites to the Missouri as a need in conjunction with the development of complementary facilities allowing camping, boating, picnicking, and other outdoor activities. The state's SCORP also recognizes that more intensive management of existing water bodies may be necessary in the future to manage conflict between uses and to improve water quality.

### **2.26. RELATED RECREATIONAL, HISTORICAL, AND CULTURAL AREAS**

The major recreation areas and tourist attractions located within a 90-minute drive of Lake Oahe are listed in Tables 2-26 and 2-27. The area covered by these destinations is truncated to the west of the project due to competing recreation opportunities offered by other Corps of Engineers reservoirs on the main stem of the Missouri River upstream from Gavins Point project. Fishermen, who make up a



large category of Lewis and Clark Lake visitors, are generally not interested in sightseeing. However, sightseers may be interested in visiting area attractions. Nearby recreation areas and attractions may also constitute side trips for campers during inclement weather to vary their recreational experience.

Recreational activities similar to those offered at Lewis and Clark Lake are also available at the adjacent Corps project, Lake Francis Case. Past surveys have indicated that the market areas of both projects have a significant overlap.

**Table 2-26. Tourist Attractions within a 90–Minute Drive of Lewis and Clark Lake**

| Attraction   | County and State | Type of Site                     |
|--|------------------|----------------------------------|
| Neligh Mills Historical Site                                     | Antelope, NE     | Historical                       |
| W.H. Over Museum, Vermillion                                     | Clay, SD         | Historical, Cultural, Scientific |
| Corn Palace, Mitchell  | Davison, SD      | Architectural                    |
| Enchanted World Doll Museum, Mitchell                            | Davison, SD      | Cultural                         |
| Friends of the Middle Border Museum, Mitchell                    | Davison, SD      | Historical                       |
| Oscar Howe Art Center, Mitchell                                  | Davison, SD      | Cultural                         |
| Prehistoric Indian Village National Historic Landmark, Mitchell  | Davison, SD      | Architectural                    |
| Fort Randall Historical Site                                     | Gregory, SD      | Historical                       |
| Buffalo Ridge 1880's Town, Sioux Falls                           | Minnehaha, SD    | Historical                       |
| Earth Resources Observation System (EROS) Data Center, Garretson | Minnehaha, SD    | Scientific                       |
| Great Plains Zoo, Sioux Falls                                    | Minnehaha, SD    | Biological                       |
| Jesse James Cave/Devil's Gulch, Garretson                        | Minnehaha, SD    | Historical, Geological           |
| Pettigrew Museum, Sioux Falls                                    | Minnehaha, SD    | Historical, Scientific           |
| Cramer-Kenyon Heritage Home, Yankton                             | Yankton, SD      | Historical                       |
| Dakota Territorial Museum, Yankton                               | Yankton, SD      | Historical                       |

**Table 2-27. Major Recreation Facilities in Primary Area of Influence**

| Name <sup>1</sup>                  | Owner              | County and State                       | Acres   | Facilities Available |           |       |                  |
|------------------------------------|--------------------|--|---------|----------------------|-----------|-------|------------------|
|                                    |                    |  |         | Camping              | Boat Ramp | Trail | Visitor's Center |
| Adams Nature Area                  | State              | Union, SD                              | 430     |                      |           | x     |                  |
| Beaver Creek Nature Area           | State              | Minnehaha, SD                          | 160     |                      |           | x     |                  |
| Big Sioux SRA                      | State              | Minnehaha, SD                          | 430     | x                    | x         | x     |                  |
| Burke Lake SRA                     | State              | Gregory, SD                            | 206     | x                    | x         | x     |                  |
| Clay County SRA                    | State              | Clay, SD                               | 121     | x                    | x         |       |                  |
| Fort Randall Dam/Lake Francis Case | COE                | Charles Mix & Gregory, SD <sup>2</sup> | 146,096 | x                    | x         | x     | x                |
| Karl E. Mundt NWR                  | USFWS <sup>3</sup> | Gregory, SD                            | 1,085   |                      |           |       |                  |
| Kelley's Cove LUA                  | State              | Yankton, SD                            | 10      |                      | x         |       |                  |
| Lake Andes NWR                     | USFWS              | Charles Mix, SD                        | 5,246   |                      |           |       |                  |

**Table 2-27 (continued). Major Recreation Facilities in Primary Area of Influence**

|  |             |  |                 |        |        |        |   |
|--|-------------|--|-----------------|--------|--------|--------|---|
| Lake Vermillion SRA  | State       | McCook, SD                                   | 360             |        | x      |        |   |
| Marindahl LUA  | State       | Yankton, SD                                  | 32              |        | x      |        |   |
| Missouri National Recreational River   | State/Local | Clay, Union, & Yankton, SD; Cedar & Dixon NE | NA <sup>4</sup> |        | x      |        |   |
| Newton Hills SP  | State       | Lincoln, SD                                  | 948             |        | x      |        | x |
| Palisades SP   | State       | Minnehaha, SD                                | 110             |        | x      |        | x |
| Union County SP  | State       | Union, SD                                    | 499             |        | x      |        | x |
| Dead Timber SRA  | State       | Dodge, NE                                    | 200             |        | x      |        |   |
| DeSoto NWR   | USFWS       | Washington, NE & Harrison, IA                | 7,823           |        | x      | x      | x |
| E.T. Mahoney SP  | State       | Saunders, NE                                 | 434             | future |        | future | x |
| Fontenelle Forest National Environmental Education Landmark  | Private     | Sarpy, NE                                    | 1300            |        |        | x      | x |
| Fort Atkinson State Park   | State       | Washington, NE                               | 154             |        |        |        | x |
| Fremont Lakes SRA  | State       | Dodge, NE                                    | 670             | x      | x      |        |   |
| Glenn Cunningham Lake  | COE         | Douglas, NE                                  | 1459            | x      | x      | x      |   |
| Louisville SRA   | State       | Cass, NE                                     | 192             | x      |        |        |   |
| Niobrara SP  | State       | Knox, NE                                     | 1156            | x      |        | x      |   |
| Papio Dam Site 18  | COE         | Douglas, NE                                  | 1023            |        | future | future |   |
| Pelican Point SRA  | State       | Burt, NE                                     | 36              | x      | x      |        |   |
| Platte River SP  | State       | Cass, NE                                     | 418             | x      |        | x      | x |
| Ponca SP   | State       | Dixon, NE                                    | 859             | x      | x      | x      |   |
| Schramm SRA  | State       | Sarpy, NE                                    | 340             |        |        | x      | x |
| Standing Bear Lake   | COE         | Douglas, NE                                  | 531             |        | x      | x      |   |
| Summit Lake Sra  | State       | Burt, NE                                     | 535             | x      | x      |        |   |
| Two Rivers SRA   | State       | Douglas, NE                                  | 964             | x      |        |        |   |
| Wehrspann Lake   | COE         | Sarpy, NE                                    | 1185            |        | x      | x      | x |
| Willow Creek SRA   | State       | Pierce, NE                                   | 1600            | x      | x      |        |   |
| Lake Manawa SP   | State       | Pottawattamie, IA                            | 1529            | x      | x      |        |   |
| Lewis and Clark SP   | State       | Monona, IA                                   | 176             | x      | x      | x      |   |
| Oak Grove SP   | State       | Sioux, IA                                    | 102             | x      |        | x      |   |
| Stone SP   | State       | Woodbury, IA                                 | 1069            | x      | x      | x      |   |
| Wilson Island SRA  | State       | Pottawattamie, IA                            | 577             | x      | x      | x      |   |
| <p>1 LUA – Lakeside Use Area<br/> 2 NWR – National Wildlife Refuge<br/> 3 Reservoir projects located in several counties are identified by the County(ies) where the dam was constructed<br/> 4 Not Applicable</p> |             |  |                 |        |        |        |   |

## **2.27. REAL ESTATE**

### **2.27.1. Land Acquisition History**

Under the authority of the Flood Control Act of 1944, the Corps acquired acreages of land for the Gavins Point Dam/Lewis and Clark Lake project. It was the general desire of the Administration at the time of acquisition that new project lands be restricted to the minimum operation and maintenance requirements and meet the readily foreseeable public access demand. The original acquisition criteria followed by the Corps were generally consistent with that policy.

The original acquisition guidelines for the Gavins Point Project was established at contour elevation 1,217 feet m.s.l. in the downstream third of the reservoir, 1,215 feet m.s.l. in the middle third, and 1,221 feet m.s.l. in the upstream third. Additional lands were acquired in fee title beyond these elevations to accommodate the effects of seepage, erosion, and wave action. In addition to the acquisition, permanent flowage easements were acquired to accommodate the occasional high water level.

### **2.27.2. Title VI**

Following is a brief description of some of the actions resulting from legislation sponsored by Senator Tom Daschle in the Water Resource Development Act of 1999 (WRDA) 106-53, and Water Resource Development Act of 2000 106-541, commonly called Title VI.

Under the provisions of Title VI, the Government retains fee title to lands and structures necessary for continuation of the operation, maintenance, repair, replacement, rehabilitation, and structural integrity of the dam and related flood control and hydropower structures, including land below the top of the exclusive flood control pool, and can lease in perpetuity all or part of certain recreation areas associated with the dams to the State of South Dakota.

For the remaining lands in South Dakota acquired outside the external boundaries of tribal reservations for the Pick-Sloan Missouri River Basin program, fee title of recreation areas was transferred to the State of South Dakota on 26 January 2002. Fee title of other lands that are above the top of the exclusive flood control pools are to be transferred to the State of South

Dakota no later than one year after the South Dakota Terrestrial Wildlife Habitat Restoration Trust Fund is fully capitalized.

### **2.27.3. Current Landholdings**

There were four types of land tenure acquired for the Gavins Point project:

- Land owned by private parties in their own right or by state or local governments;
- Land owned by the United States on behalf of the tribes (trust lands);
- Land owned by the United States on behalf of Indian individuals (allotted trust lands); and
- Land owned by the United States in its own right or as public domain.

Generally, the government acquired a fee simple estate at the Gavins Point project, subject only to certain existing easements or rights. Table 2-28 reflects the approximate acreages currently owned by the Government at the project. This section reflects lands transferred in fee title under Title VI (Public Law 105-53, WRDA 1999, as amended by P.L. 106-541, WRDA 2000) to the State of South Dakota in 2002. These lands are not included in this Master Plan. Additional lands will be transferred upon capitalization of the trust funds for each entity. These lands will be managed in perpetuity for the restoration of terrestrial wildlife habitat loss that occurred as a result of flooding related to the Gavins Point project and other reservoir projects carried out as part of the Pick-Sloan Missouri River Basin Program.

Approximately 626.60 acres were listed as public domain lands. These lands were permanently withdrawn, set aside, and reserved for use in connection with the Gavins Point project. However, due to erosion caused by meandering of the Missouri River throughout the years, the lands described in P.L.O. 1291 dated 24 April 1956 were actually nonexistent at the time the land order was issued so all land was purchased from land owners.

**Table 2-28. Government-Owned Lands at Gavins Point Project (acres)**

|                          | South Dakota Counties |                | Nebraska Counties |              | Project   |
|--------------------------|-----------------------|----------------|-------------------|--------------|-----------|
|                          | <u>Bon Homme</u>      | <u>Yankton</u> | <u>Knox</u>       | <u>Cedar</u> | Totals    |
| <u>Acquisition Lands</u> |                       |                |                   |              |           |
| Fee Land                 | 16,106.89             | 3,278.10       | 14,741.17         | 695.11       | 34,821.27 |
| Easement                 | 181.82                | 0.41           | 1,725.47          | 5.99         | 1,913.69  |
| Indian                   |                       |                | 593.10            |              | 593.10    |
| Temporary Use            |                       |                |                   | 19.92        | 19.92     |
| Total Acquired           | 16,288.71             | 3,278.51       | 17,059.74         | 721.02       | 37,347.98 |
| <u>Disposal Lands</u>    |                       |                |                   |              |           |
| Title VI                 | 238.87                | 1,244.74       |                   |              | 1,483.61  |
| Fee Land                 | 8.32                  |                |                   | 0.22         | 8.54      |
| Easement                 |                       |                |                   | 22.60        | 22.60     |
| Total Disposed           | 247.19                | 1,244.74       |                   | 22.82        | 1,514.75  |
| Total Acres Managed      | 16,041.52             | 2,033.77       |                   | 698.20       | 35,833.23 |

#### 2.27.4. Executive Order Surveys

Executive Order 12512, dated 25 April 1985, and the Federal Property Management Regulations contained in 41 CFR 101-47 require periodic review of project landholdings to determine if Federal lands are being either overused or underused or are not being put to optimum use. To meet this requirement, the Omaha District conducts inspections of all projects, including the Gavins Point Dam/Lewis and Clark Lake Project.

#### 2.27.5. Encroachments

The majority of encroachments on project lands are found in agricultural/grazing leases and by adjacent landowners. Lessees and adjacent landowners sometimes expand their farming/ranching

operations onto Corps-managed land without the appropriate authorization. Small portions of project lands are sometimes grazed or farmed. Occasionally, adjacent landowners will store machinery, construct corrals, or erect storage buildings on project land. These encroachments are usually minor in nature. Adjacent landowners/lessees sometimes find it difficult to readily define project boundaries in some areas. This occasionally results in unintentional encroachments.

#### **2.27.6. Boundary Monumentation and Fencing**

Considerable emphasis has been placed on boundary monumentation on project lands. Extensive resources are expended on monumenting those areas currently managed for wildlife purposes, agricultural leasing, and intensive public use. Fencing has also been a priority in both wildlife and recreation areas. Encroachments and boundary line disputes are generally reduced after fencing project boundaries.

#### **2.27.7. Relocation Contracts**

A relocation contract is an agreement that provides substitute facilities for those acquired facilities that will interfere with project development.

#### **2.27.8. Outgrants**

An outgrant is any real estate instrument used to convey an interest or temporary use of project land. The types of outgrants issued at the Gavins Point Dam/Lewis and Clark Lake project are leases, licenses, permits, and easements. The Corps has issued 115 outgrants on project land.

Leases. A lease is a contract between the owner (lessor or landlord) and the tenant (lessee) setting forth the term of occupancy and the conditions under which the tenant may occupy and use the property. A lease conveys an interest in the property for a set term. There are 12 public park/recreation leases, and one miscellaneous lease on the project. Five of the public park/recreation leases located on the South Dakota side of the project were transferred and/or assigned to the State of South Dakota pursuant to Title VI.

Licenses. A license grants authority to enter or use another's land or property without having ownership in it. It is revocable at will. Action without a license constitutes trespass. This type of outgrant includes Archaeological Resources Protection Act permits issued pursuant to 32 CFR 229. There are 10 licenses issued at the project.

Permits. A permit is a revocable privilege granted to another Federal agency to use real property for a specific purpose without conferring possession. There are four permits issued to various Federal agencies for use of project lands.

Easements. An easement allows one party to use certain lands of another party. An easement conveys an interest in the property. Rights-of-way are the most frequent easement requests for public land. There are 89 easements for rights-of-way for waterlines, roads, and gas lines throughout the project.

#### **2.27.9. Flowage Easements**

The flowage easements acquired at the Gavins Point Dam/Lewis and Clark Lake project give the Government a perpetual right to overflow the land when necessary as a result of construction, maintenance, and operation of the project. The Government also has the right to enter the easement lands as needed as well as to remove from the easement lands any natural or manmade obstructions or structures which, in the opinion of the Government, may be detrimental to the operation and maintenance of the project. The flowage easements were acquired subject to "existing easements for public roads and highways, public utilities, railroads, and pipe lines."

Historically, it has been Corps policy to prohibit structures for human habitation of flowage easements acquired by the Corps of Engineers. Construction and/or maintenance of non-habitable structures on the flowage easement are subject to prohibition or regulation by the District Engineer.

## **2.28. PERTINENT PUBLIC LAWS**

### **2.28.1. Civil Authority**

Except as otherwise provided by Federal law or regulation, State and local laws and ordinances apply on Gavins Point Dam/Lewis and Clark Lake project lands and waters. These include, but are not limited to, the following:

- Operation and use of motor vehicles, vessels, and aircraft;
- Hunting, fishing, and trapping;
- Display or use of firearms or other weapons;
- Camping, starting or tending fires, and use of fireworks;
- Civil disobedience and criminal acts;
- Littering, sanitation, and pollution.

Enforcement of State and local laws and ordinances will be handled by the appropriate State and local law enforcement agencies.

### **2.28.2. Corps Authority**

Rules and regulations governing public use of water resource development projects administered by the Corps are contained in Title 36, Part 327 of the Code of Federal Regulations. Persons designated by the District Engineer have the authority to issue citations for violations of rules and regulations governing public use of Corps water resource projects. If a citation is issued, the person charged with the violation may be required to appear before a U.S. Magistrate for trial.

### **2.28.3. Federal Authority**

The following Federal public laws, Executive orders, and cooperative agreements pertain to authorization of the project, present and future development, and operation of project lands and waters.



## General Laws and Authorities

Public Law 534, 78th Congress (58 Stat. 887), 22 December 1944. Flood Control Act of 1944, as amended. This act authorizes the construction of certain public works on rivers and harbors for flood control and other purposes. Section 4 authorizes providing facilities at reservoir areas for public use, including recreation and fish and wildlife conservation. Senate Document 247 (78<sup>th</sup> Congress, 2nd Session) is the congressional document for the project. The Gavins Point project is part of the multipurpose reservoir system on the Missouri River and provides for flood control, navigation, hydropower, recreation, and fish and wildlife management. The primary function of the project is to reregulate the releases from the upstream Fort Randall project; it is necessary to correlate water releases with regional demand for power generation. The Gavins Point project regulates these releases. As amended in 1962 by Section 297 of Public Law 87-874, the act authorizes the Corps to develop and maintain park and recreation facilities at all water resources projects controlled by the Secretary of the Army.

Public Law 280, 83rd Congress (67 Stat. 588), 15 August 1953, Indians – Criminal Offenses and Civil Causes – State Jurisdiction. Under the provisions of this law, Nebraska accepted both civil and criminal jurisdiction over the Indian reservations within its boundaries. The Santee Reservation is located entirely within Nebraska. The amount of land acquired from the Santee Sioux Tribe and its members was 593.10 acres. The acquisition was ratified by the Santee Tribal Council by Resolution No. 91, dated 25 November 1955.

Public Law 710, 83rd Congress (68 Stat. 973), 30 August 1954. Gavins Point Reservoir – Change of Name to Lewis and Clark Lake. This law changed the name of the reservoir behind Gavins Point Dam to Lewis and Clark Lake.

Public Law 1028, 84th Congress (70A Stat. 150), 10 August 1956. United States Code, Title 10 and Title 32. Section 2667 of this law authorizes the Secretary of a military department to lease non-excess land when it is advantageous to the United States. Grazing leases are also authorized under this provision. Sections 2668 and 2669 authorize the granting of easements and rights-of-way for many purposes, including transmission lines and gas, water, and sewer pipelines.

Public Law 88-578 (78 Stat. 897), 3 September 1964, Land and Water Conservation fund Act of 1965, as amended. This act establishes a fund from which Congress can make appropriations for outdoor recreation. The fund derives revenue from entrance and user fees, the sale of surplus

Federal property, and the Federal motorboat fuel tax. Entrance and user fees at reservoirs are made possible by Section 2(a) of this act.

Public Law 89-72 (79 Stat. 213), 9 July 1965, Federal Water Project Recreation Act, as amended.

This act provides for the formulation of uniform policies with respect to recreation, fish and wildlife benefits, costs of Federal multiple-purpose resource projects, and other purposes. Under this law, the COE can cost-share with the local sponsor on additional lands, recreation facilities and fish and wildlife enhancement.

Public Law 90-483 (82 Stat. 731), 13 August 1968, River and Harbor Act of 1968, as amended.

This act authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and other purposes. Section 210 restricts the collection of entrance fees at Corps lakes and reservoirs after 31 March 1970 to users of highly developed facilities requiring the continuous presence of personnel.

Public Law 91-611 (84 Stat. 1818), 21 December 1970, River and Harbor and Flood Control Act of 1970. Section 213 appropriated funds to resolve the high groundwater problems in the vicinity of the town of Niobrara, Nebraska. This resulted in the acquisition of the Niobrara State Park and the town site of Niobrara.

Executive Order 11644, 8 February 1972, Use of Off-Road Vehicles on Public Lands. This order establishes a uniform Federal policy regarding the use of vehicles such as trail bikes, snowmobiles, dune-buggies, and others on public lands. Section 3 provides guidance for establishing zones of use for such vehicles.

Public Law 95-625 (95 Stat. 3512), 10 November 1978, National Parks and Recreation Act. The 59-mile segment of the Missouri River immediately downstream from Gavins Point Dam was designated as a National Recreational River by Section 707 of this act. Section 4(a) amended the National Trails System Act, Public Law 90-503, to include the category of National Historic Trails and designated the Lewis and Clark Trail as one of four national Historic Trails. The purpose of these trails is the identification and protection of historic routes and their remnants and artifacts for public use and enjoyment. Administrative responsibility has been assigned to the National Park Service. A section of the Lewis and Clark National Historic Trail traverses the Gavins Point Project.

Permanent Order 2-7 (Omaha District), 5 August 1983. As a result of this Permanent Order, the Lewis and Clark Project Office was renamed Gavins Point Project Office.

Public Law 99-662 (100 Stat. 4082), 17 November 1986, Water Resources Development Act of 1986. This legislation sets forth non-Federal cost-sharing requirements for all water resources projects. Section 906 of this act supplements the responsibility and authority of the Secretary of the Army pursuant to the Fish and Wildlife Coordination Act.

Public Law 106-53, 17 August 1999, Title VI of the Water Resources Development Act of 1999. Cheyenne River Sioux Tribe, Lower Brule Sioux Tribe, and State of South Dakota Terrestrial Wildlife Habitat Restoration. Under this provision, the Government retains fee title to lands and structures necessary for the continuation of the operation, maintenance, repair, replacement, rehabilitation, and structural integrity of the dam and related flood control and hydropower structures, including land below the top of the exclusive flood control pool, and can lease in perpetuity all or part of certain recreation areas associated with the dams to the State of South Dakota or to the Cheyenne River Sioux Tribe. Title VI establishes the South Dakota and Cheyenne River Sioux Tribe Terrestrial Wildlife Habitat Restoration Trust Fund. After these funds are fully capitalized the interest may be used for costs associated with the restoration and management costs associated with the transferred lands. This legislation also requires the Secretary to arrange for the U.S. Geological Survey to complete a comprehensive study of the potential impacts of the transfer of lands under this title on water flows in the Missouri River and prohibits such transfers until the secretary determines that the transfers will not significantly reduce the amount of water flow to the downstream States of the Missouri River.

Public Law 106-541, 11 December 2000, Title VI of the Water Resources Development Act of 2000. Section 540 of this act amended public law 106-53. The section applied a deadline of 1 January 2002 for land transfers; included direction on the lease of specific recreation areas to the State of South Dakota; and added a requirement to clean up each open dump and hazardous waste site. The Act also established a Cultural Resources Advisory Commission as well as a requirement to inventory and stabilize each cultural and historic site on land to be transferred.

## Environmental Quality Statutes

Public Law 85-624 (72 Stat. 563), 12 August 1958, Fish and Wildlife Coordination Act. This law amends and renames the Fish and Wildlife Coordination Act of 10 March 1934. The 1958 act requires that fish and wildlife conservation receive equal consideration with other features of water resources development programs; that proposals for work affecting any body of water be coordinated with the USFWS and State wildlife agency; that recommendations of the USFWS and State wildlife agency be given full consideration; and that justifiable means and measures for wildlife purposes, including mitigation measures, be adopted. It also required that adequate provisions be made for the use of project lands and waters for the conservation, maintenance, and management of wildlife resources, including their development and improvement. The act provides that the use of project lands primarily for wildlife management by others be in accordance with a General Plan approved jointly by the Department of the Army, Department of the Interior, and State wildlife agencies.

Public Law 86-717 (74 Stat. 817), 6 September 1960, Conservation of Forest Lands in Reservoir Areas. This law provides for the development and maintenance of forest resources on Corps-managed lands and the establishment and management of vegetative cover so as to encourage future resources of readily available timber and to increase the value of such areas for conservation.

Public Law 87-88 (75 Stat. 204), 20 July 1961, Federal Water Pollution Control Act Amendments of 1961, as amended. Section 2 (b) (1) of this act gives the Corps responsibility for water quality management of Corps reservoirs. This law was amended by the Federal Water Pollution Control Act Amendment of 1972, Public Law 92-500.

Public Law 89-80 (79 Stat. 244), 20 July 1965, Water Resources Planning Act. This act is a Congressional statement of policy to meet rapidly expanding demands for water throughout the Nation. The purpose is to encourage the conservation, development, and use of water-related land resources on a comprehensive and coordinated basis by the Federal, State, and local governments; individuals; corporations; business enterprises; and others concerned.

Public Law 90-583 (82 Stat. 1146), 17 October 1968, Noxious Plant Control. This law provides for control of noxious weeds on land under the control of the Federal Government.

Public Law 91-190 (83 Stat. 852), 1 January 1970, National Environmental Policy Act of 1969. Section 101 of this act establishes a national environmental policy. Section 102 requires that all Federal agencies shall, to the fullest extent possible, use a systematic, interdisciplinary approach that integrates natural and social sciences and environmental design arts in planning and decision making; study, develop, and describe appropriate alternatives to recommend courses of action in any proposal that involves unresolved conflicts concerning alternative uses of available resources; and include an Environmental Impact Statement (EIS) in every recommendation or report on proposals for major Federal actions significantly affecting the quality of the human environment.

Public Law 91-224 (84 Stat. 114), 3 April 1970, Water Quality Improvement Act of 1970 and Environmental Improvement Act of 1970. The Federal Water Pollution Control Act of 1970 provides that each Federal agency having jurisdiction over any real property or facility or engaged in any Federal public works activity of any kind shall comply with applicable water quality standards.

Public Law 92-500 (86 Stat. 816), 18 October 1972, The Federal Water Pollution Control Act Amendments of 1972, as amended. This law amends the Federal Water Pollution Control Act and establishes a national goal of eliminating pollutant discharges into waters of the United States. Section 404 authorizes a permit program for the disposal of dredged or fill material in the Nation's waters that is to be administered by the Secretary of the Army acting through the Chief of Engineers. This law was later amended by the Clean Water Act of 1977, Public Law 95-217, to provide additional authorization to restore the Nation's water.

Executive Order 11752, 19 December 1973, Prevention, Control, and Abatement of Environmental Pollution at Federal Facilities. The purpose of this Executive order is to assure that the Federal Government provides leadership in the design, construction, management, and operation and maintenance of its facilities in the nationwide effort to protect and enhance the quality of air, water, and land resources through compliance with applicable standards and in full cooperation with State and local governments.

Public Law 93-205 (87 Stat. 884), 28 December 1973, Conservation, Protection, and Propagation of Endangered Species Act of 1973, as amended. This law repeals the Endangered Species Conservation Act of 1969. It also directs all Federal departments/agencies to carry out programs to conserve endangered and threatened species of fish, wildlife, and plants and to preserve the habitat of these species in consultation with the Secretary of the Interior. This act establishes a

procedure for coordination, assessment, and consultation. This act was amended by Public Law 96-159.

Public Law 93-523 (88 Stat. 1660), 16 December 1974, Safe Drinking Water Act, as amended. This act amends the Public Health Service Water Act to assure that the public is provided with safe drinking water. This law states that all potable water at civil works projects will meet or exceed the minimum standards required by law. This act was amended by the Safe Drinking Water Act Amendments of 1986, Public Law 99-339.

Executive Order 11988, 24 May 1977, Floodplain Management. This order outlines the responsibilities of Federal agencies in the role of floodplain management. Each agency shall evaluate the potential effects of actions on floodplains and should not undertake actions that directly or indirectly induce growth in the floodplain, unless there is no practical alternative. Agency regulations and operating procedures for licenses and permits should include provisions for evaluation and consideration of flood hazards. Construction of structures and facilities on floodplains must incorporate flood proofing and other accepted flood protection measures. Agencies shall attach appropriate use restrictions to property proposed for lease, easement, right-of-way, or disposal to non-Federal public or private parties.

Executive Order 11990, 24 May 1977, Protection of Wetlands. This order directs Federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands. Section 2 states that agencies shall avoid undertaking or assisting in new construction located in wetlands unless there is no practical alternative.

Public Law 95-217 (91 Stat. 1566), 27 December 1977, Clean Water Act of 1977, as amended. This act amends the Federal Water Pollution Control Act of 1970 and extends the appropriations authorization. The Clean Water Act is a comprehensive Federal water pollution control program that has as its primary goal the reduction and control of the discharge of pollutants into the Nation's navigable waters. The Clean Water Act of 1977 has been amended by the Water Quality Act of 1987, Public Law 100-4.

Executive Order 12088, 13 October 1978, Federal Compliance with Pollution Control Standards. The purpose of this order is to ensure Federal compliance with applicable pollution control standards. The disposal of toxic substances and solid waste and the control of noise, air, and

water pollution will be in accordance with this Executive Order on prevention, control, and abatement of air and water pollution at Federal facilities.

Public Law 95-632 (92 Stat. 3751), 10 November 1978, Endangered Species Act Amendments of 1978. This law amends the Endangered Species Act Amendments of 1973. Section 7 directs agencies to conduct a biological assessment to identify threatened or endangered species that may be present in the area of any proposed project. This assessment is conducted as part of a Federal agency's compliance with the requirements of Section 102 of the National Environmental Policy Act (NEPA) of 1969.

Public Law 96-159 (93 Stat. 3751), 28 December 1979, Endangered Species Act of 1973, as amended. This amendment expanded the act to protect endangered plants. This amendment requires the publishing of a summary and map when proposing land as critical habitat and requires Federal agencies to ensure projects "are not likely" to jeopardize an endangered species. In addition, it authorizes all those seeking exemptions from the act to get permanent exemptions for a project unless a biological study indicates the project would result in the extinction of a species.

Public Law 96-366 (94 Stat. 1322), 29 September 1980, Fish and Wildlife Conservation Act of 1980. This law enables states to obtain funds to conduct inventories and conservation plans for non-game wildlife. It also encourages Federal departments and agencies to use their statutory and administrative authority to conserve and promote conservation in accordance with this act.

Public Law 97-140 (95 Sta. 1717), 29 December 1981. Section 4 of this law authorizes the relocation of the water supply intake facility at Springfield, South Dakota.

Public Law 339 (100 Stat. 642), 19 June 1986, Safe Drinking Water Act Amendments of 1986. These amendments provide further regulation regarding national primary drinking water, enforcement of these regulations, and variances and exemptions to the act. These amendments also provide for the protection of underground sources of drinking water and provide grants to tribes in addition to contract assistance to carry out the function of these amendments.

Public Law 100-4 (101 Stat. 7), 4 February 1987, Water Quality Act of 1987. This act amends the Federal Water Pollution Control Act to not only provide for renewal of the quality of the Nation's

waters but also provide construction grant amendments, standards, enforcement, permits, and licenses.

### Cultural Resource Statutes

Public Law 209, 59th Congress (34 Stat. 225), 8 June 1906, The Antiquities Act. This act makes it a Federal offense to appropriate, excavate, injure, or destroy any antiquity, historic ruin, monument, or object of scientific interest located on lands owned or controlled by the United States without having permission from the Secretary of the department having jurisdiction thereof.

Public Law 86-523 (74 Stat. 220), 27 June 1960, Reservoir Salvage Act, as amended. This act provides for (1) the preservation of historical and archaeological data that might otherwise be lost or destroyed as the result of flooding or any alteration of the terrain caused as a result of any Federal reservoir construction projects; (2) coordination with the Secretary of the Interior whenever activities may cause loss of scientific, prehistorical, or archaeological data; and (3) expenditure of funds for recovery, protection, and data preservation.

Public Law 89-665 (80 Stat. 915), 15 October 1966, Historic Preservation Act, as amended. This act states a policy of preserving, restoring, and maintaining cultural resources and requires that Federal agencies (1) take into account the effect of any undertaking on any site on or eligible for the NRHP; (2) afford the Advisory Council on Historic Preservation the opportunity to comment on such undertaking; (3) nominate eligible properties to the NRHP; (4) exercise caution in the disposal and care of Federal property that might qualify for the NRHP; and (5) provide for the maintenance of Federally owned sites on the NRHP.

Public Law 96-95 (93 Stat. 721), 31 October 1979, Archaeological Resources Protection Act of 1979. This act protects archaeological resources and sites that are on public and Indian lands, and fosters increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals. It also establishes requirements for issuance of permits by the Federal land managers to excavate or remove any archaeological resource located on public or Indian lands.



Executive Order 11593, 13 May 1971, Protection and Enhancement of the Cultural Environment. Section 2 of the order outlines the responsibilities of Federal agencies in accordance with the National Environmental Policy Act of 1969, the National Historic Preservation Act of 1966, the Historic Sites Act of 1935, and the Antiquities Act of 1906. Section 3 outlines specific responsibilities of the Secretary of the Interior including review and comment upon Federal agency procedures submitted under this order.

Public Law 93-291 (88 Stat. 174), 24 May 1974 Preservation of Historical and Archeological Data. This act amends the Act of 27 June 1960 to provide for the preservation of historical and archaeological data (including relics and specimens) that might otherwise be lost as the result of the construction of a dam. Section 3 (a) requires whenever any Federal agency finds, or is notified in writing, by an appropriate historical or archaeological authority, that its activities in connection with any Federal construction project or Federally licensed project, activity, or program may cause irreparable loss or destruction of significant scientific, pre-historical or archaeological data, such agency shall notify the Secretary of the Interior, in writing, and shall provide the Secretary with the appropriate information concerning the project, program, or activity. Section 7 (a) requires any Federal agency responsible for a construction project to assist/transfer to the Secretary of the Interior such funds as may be agreed upon, but not more than one percent of the total appropriated project costs. The costs of survey, recovery, analysis, and publication shall be considered non-reimbursable project costs.

### Cooperative Agreements

General Plans for Fish and Wildlife Management, June 1957, as amended. The General Plans were signed by the Assistant Secretary of the Army, the Assistant Secretary of the Interior, the Director, South Dakota Department of Game, Fish and Parks, and the director, Nebraska Game, Forestation and Park Commission.

Cooperative Agreement for Fish and Wildlife Management, June 1959. This agreement was signed by the Assistant Secretary of the Army and the Director, Bureau of Sport Fisheries and Wildlife. It designated lands to be made available to the Secretary of the Interior for establishing a National Fish Hatchery and lands to be made available to the South Dakota Department of Game, Fish and Parks and the Nebraska Game, Forestation and Park Commission for fish and wildlife management. In November 1964, an amendment to the General Plan for Wildlife Conservation and Management was signed by the Director, Nebraska Game, Forestation and Park Commission; Secretary of the Army; and Secretary of the Interior. This amendment replaced the

aforementioned cooperative agreement for the State of Nebraska. As a result, the Bazile Creek Wildlife Management area was licensed to the State of Nebraska in 1966; Springfield Bottoms to the State of South Dakota in 1965; and a permit was granted to the USFWS in 1956 for operation of a fish hatchery. Cottonwood Lake (Lake Yankton) was added to this permit in 1966.

Cooperative Agreement with States of South Dakota and Nebraska (since 1993). Cooperation exists with the Purple Loosestrife Committee for using biological control agents in an attempt to control the plant on Lewis and Clark Lake.

Cooperative Agreement between the U.S. Department of the Interior and the U.S. Department of the Army for Implementation of Section 707 of Public Law 95-625, an Act amending the Wild and Scenic Rivers Act, June 1981. The 59-mile reach downstream from Gavins Point Dam was designated the Missouri National Recreational River (MNRR) by Public Law 95-625. The cooperative agreement divided the responsibilities of management and implementation. The National Parks Service was given responsibility for overall administration of the MNRR consistent with national policies for management of the entire National Wild and Scenic Rivers System. The Corps of Engineers agreed to plan, design, fund, construct, and operate this segment consistent with the policies in the agreement. There is a close relationship between the operation of Gavins Point Dam and the management of the MNRR reach of the river.

## **2.29. MANAGEMENT PLANS**

There are several management plans that provide the direction of activities and expenditures for the Gavins Point Dam/Lewis and Clark Lake project. The plans, discussed below, are interrelated and each must be considered when planning for the future.

Operational Management Plan (OMP). The OMP is a management action document that describes in detail how resource objectives and concepts prescribed in the Master Plan will be implemented and achieved. It replaces the Master Plan appendices. The OMP for the Gavins Point Dam/Lewis and Clark Lake project was approved in October 1997.

Shoreline Management Plan. A Shoreline Management Plan is prepared as part of the Operational Management Plan. It is the policy of the Chief of Engineers to protect and manage shorelines of all Civil Works water resource development projects under Corps jurisdiction in a manner that

will promote the safe and healthful use of these shorelines by the public while maintaining environmental safeguards to ensure a quality resource for use by the public. The objectives of all management actions are to achieve a balance between permitted private uses and resource protection for general public use. This plan is prepared for each Corps project where private shoreline use is allowed. Private shoreline uses may be authorized in designated areas consistent with approved use allocations specified in the Shoreline Management Plan. The Shoreline Management Plan for Gavins Point/Lewis and Clark Lake was last approved in 1977.

Seaplane Landing Plan. In order to provide for the safe and compatible use of seaplanes with other project purposes, the Omaha District has established a plan that applies uniform policies and rules for all Corps-managed lakes in the Omaha District. Lewis and Clark Lake is open to seaplane activities; subject to the rules, regulations, and restrictions contained in the Seaplane Landing Plan, delineated on the maps attached to that report, and defined in ER 1130-2-411.

Cultural Resources Management Plan (CRMP). The CRMP provides detailed information on a comprehensive program to direct historic preservation compliance activities and the effective and responsible management of historic properties and other cultural resources.

General Plan. Guidelines for General Plans are found in Section 663(b) of the Fish and Wildlife Coordination Act (Public Law 85-624). The use of Gavins Point Dam/Lewis and Clark Lake project lands and waters for wildlife conservation purposes shall be in accordance with a General Plan approved jointly by (1) the Corps of Engineers, (2) the Secretary of the Interior, and (3) the Director of the South Dakota Game, Fish and Parks and/or the Director of the Nebraska Game, Forestation and Parks Commission. The signature by the Secretary of the Interior represents coordination with the USFWS and the BIA.

North American Waterfowl Management Plan (NAWMP). In 1989, the Department of the Interior and the Corps of Engineers signed a Memorandum of Understanding (MOU) in support of the NAWMP. The NAWMP is a guideline for cooperation between public and private groups for restoring waterfowl habitat and populations to the same numbers as occurred during the early 1970s. The NAWMP will be implemented through joint ventures of public and private groups. The NAWMP identified 34 key areas nationwide to focus on for waterfowl habitat restorations.

### 3. SPECIAL PROBLEMS

This chapter provides an overview of the key administrative, social, and environmental factors that influence and constrain present and future options of use, management, and development of land and water resources at the Gavins Point Dam/Lewis and Clark Lake project. This information supplements the discussion of the factors that influence resource development presented in Chapter 2. Considered together with resource objectives and development needs presented in Chapter 6, these factors determine the most appropriate uses of project resources.

#### 3.1. PURPLE LOOSESTRIFE

Purple loosestrife (*Lythrum salicaria*) is an upright plant that is widely distributed throughout the Northern United States and is readily identified by its purple flower, which blooms from mid-July through August, height of 2-7 feet, four-sided stem, and opposite arrangement of leaves close to the stem which alternate 90 degrees in direction with each ascending pair of leaves. This plant is an invader of wet sites and is a very aggressive plant capable of spreading by producing large amounts of seed, spreading via a dense root system or by the vegetative reproduction of small portions of the plant. The plant has a competitive advantage over other aquatics in that it can continue to grow and spread under a wide range of water regimes that may tend to suppress the growth of other plant species. This attribute makes the plant especially troublesome in reservoirs that are subject to frequent pool level fluctuations. The undesirable qualities of purple loosestrife are the negative effects it can have on wetland animal species through the alteration and conversion of productive habitat. The plant offers very little cover in comparison with typical cattail vegetation, crowds out small but important open water areas within a marsh used by waterfowl and is not readily used by animal species as a food source or nesting substrate.

The elimination or control of the plant on project lands would be difficult if not impossible because of its prevalence, growth characteristics, and proximity to desirable plants and water which restricts the use of many chemical and mechanical treatments. Since 1993 biological control agents such as beetles (*Galarucella* spp.) and weevils (*Hylobius transversovittatus*) have been used to control the plant. *Galarucella* is raised at the Springfield prison for release in Lewis and Clark Lake, Niobrara River, and Platte River.

Purple loosestrife was first noted in 1983, during the preparation of the Gavins Point Dam Pool Raise Study. An estimate based on 1983 mapping and reconnaissance indicated 3,360 acres of wetland area on the lake was infested with the plant. The pattern or distribution of the plant is mainly downstream from the confluence of the Niobrara River and seems to be heaviest on the Nebraska side of the lake. This suggests that the origin of purple loosestrife into the lake was most likely from inflows of the Niobrara River.

Canada Thistle (*Cirsium arvense*) is another problem plant in the Springfield wetland area. Several biological control agents have been released in the past to aid in the control of this plant as well.

### **3.2. SALT CEDAR**

Salt Cedar (*Tamarix* spp.) is a nonnative shrub that was introduced to the western United States as an ornamental shrub in the early 1800s and is now found throughout the western U. S. Salt Cedar grows to 12-15 feet in height, has slender branches with gray-green foliage, scale-like leaves about 1/16 inch long, and large numbers of pink to white flowers that appear in dense masses on 2-inch long spikes from March to September. Salt Cedar shrubs have long taproots that allow them to access deep water tables and interfere with aquatic ecosystems. It is a fire-adapted species that disrupts the structure and stability of native plant communities and degrades native wildlife habitat by outcompeting and replacing native plant species. In 2003, Salt Cedar was first discovered at Lewis and Clark Lake in Management Unit #19, the Emanuel Creek to Running Water unit. The herbicide Rodeo will be used to control Salt Cedar at the project and prevent it from spreading.

### **3.3. SEDIMENTATION**

Sedimentation is an influential factor in water-oriented recreation planning. Some public recreation areas have excessive operation and maintenance costs, and the sedimentation process limits their useful life. The major sedimentation processes occurring in Lewis and Clark Lake are shoreline erosion, littoral drift, delta encroachment, and other sediment deposition. These processes present hazards to boaters, impair/change fisheries, create marshy areas, and jeopardize recreation facilities and infrastructure.

Sediment deposition into Lewis and Clark Lake averages 4 million tons, or 2,625 acre-feet, each year. Over half of this load is contributed by the Niobrara River drainage, with the remaining material originating from the Niobrara to Fort Randall Dam stretch of the Missouri River and to a small degree, small tributaries and streams. An expansive delta has formed in an area of Lewis and Clark Lake at its upstream boundary due to suspended solids settling out of the Niobrara and Missouri Rivers as inflow velocity slows upon entering the reservoir. The development of a delta/marsh area in the upper end of the reservoir was foreseen prior to authorization and construction of Gavins Point Dam and made a part of the public review process. In the Detailed Project Report, Appendix II, Sediment, dated December 1949, it was estimated that 2,400 acre-feet of sediment per year or a total of 120,000 acre-feet of sediment would be contributed to the lake during the first 50 years of operation. The total sediment deposition to the top of the Multiple Use Pool (elevation 1,208) from 1955 to 1995 was 99,000 acre-feet.

The results of increasing accumulations of sand in the lake have been manifested in different ways. Navigation, domestic water intakes, marina operations, and boat ramps have all been affected due to sedimentation. Navigation of boats and other pleasure craft has been made more difficult in the upper reaches of the lake, and constantly changing deposition patterns necessitates choosing different routes through the developing marsh area on an annual basis. In general, recreational boating for larger watercraft has effectively been restricted to an area beginning at the dam to an area near the Charley Creek management unit. The maintenance of domestic water intakes is made more difficult because of shallow water depths while creating water hazards for boats. The operation of marinas in the upper end of the lake has been affected, shifting the public use from pleasure boating, swimming, and water-skiing and to fishing and hunting and non-water based recreation. The closure of the marina located at Springfield is an example of this use. Boat ramps and bays on the lake are subjected to littoral drift and the accumulation of sediment to the extent of making them unusable without routine dredging.

### **3.4. NEED FOR GRAZING CONTROLS**

Some of the project lands are being overgrazed by cattle from adjacent lands. Fencing of these lands, while perhaps desirable from a management standpoint, is economically infeasible and would be the source of a great deal of public controversy. Careful monitoring of leased lands and continuing coordination between management personnel and ranchers are essential if degradation of these lands is to be prevented. Grazing control was an issue area brought up by the public at the open house public meetings.

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## **4. PUBLIC INVOLVEMENT AND COORDINATION**

In 2002 the Corps began the process of updating the Gavins Point/Lewis and Clark Lake Master Plan which was last approved in 1988. A series of public meetings was held in August 2002 at Yankton, South Dakota; Niobrara and Hartington, Nebraska; and Sioux City, Iowa. The purpose of these meetings was to seek public input regarding (1) the long-range goals for the Gavins Point Dam/Lewis and Clark Lake project and (2) the management and development of project lands and water.

The public meetings were held as informal workshops in order to afford guests adequate time to discuss issues with representatives of the Corps of Engineers. A slide show discussing the Master Plan process, detailed maps of Lewis and Clark Lake, and various handouts were available to those who attended. All persons attending the meetings were added to the mailing list of interested persons that the Corps maintains. Members of the public suggested that the Corps:

1) Improve boat ramp access; 2) improve access to the river for non-boating activities such as fishing; 3) address the sedimentation problems near Springfield; and 4) create a marked trail for walkers and bicyclists along the Bottom Road near Springfield. Two comments were in favor the shooting range.

In regards to the comments, 1) boat ramp access is addressed in Section 2.24.4; 2) access to the river for non-boating activities such as fishing is provided at many of the management units, particularly the downstream units such as Cottonwood and the Day Use Areas; 3) sedimentation is discussed in detail in Section 2.5 of this document; at this point no plan is in place to move, redirect, or remove the incoming sediment from the reservoir because many plans have been looked at and discarded as impractical or too costly and 4) the marked trail for walkers and bicyclists is a good idea but would be too costly to accomplish unless it was completed by means of a challenge cost-share.

In addition, comments were solicited from the EPA, U.S. Fish and Wildlife Service, South Dakota Game and Parks Department, and the Nebraska Game and Parks Commission. The only agency response was from the Nebraska Game and Parks Commission, which notified the Corps of state listed species present on project lands but had no other comments.



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## **5. LAND USE ALLOCATION, LAND CLASSIFICATIONS, AND RESOURCE OBJECTIVES**

This Chapter presents the land use plan for the Gavins Point Dam/Lewis and Clark Lake project area. In the plan, specific parcels of land are zoned into land use categories based on resource capability. Combined with the project-wide and site-specific resource objectives presented in this Chapter and Chapter 6, respectively, the land use plan provides a conceptual guide for the use, management, and development of all project lands. Together, these elements are the heart of this Master Plan.

The Gavins Point Dam/Lewis and Clark Lake project is divided into management areas. Division of the project into individual areas was an integral part of the planning processes and facilitated identification of the most appropriate land and resource uses of the various project areas. The boundaries of the management areas are based on physical, administrative, and/or operational characteristics.

### **5.1. LAND ALLOCATION**

Land use allocations identify the authorized purposes for which project lands were acquired. The entire Gavins Point Dam/Lewis and Clark Lake project has a land allocation of Project Operations. Project Operations lands are those lands acquired to provide safe, efficient operation of the project for its authorized purposes. These project purposes include flood control, hydropower, navigation, irrigation, municipal and industrial water supply, fish and wildlife conservation, and recreation. Separable lands were not acquired for purposes of recreation, fish and wildlife conservation, or mitigation.

### **5.2. LAND USE CLASSIFICATIONS**

All lands acquired for project purposes are classified to provide for development and resource management consistent with authorized project purposes and other Federal laws. The classification process refines the land allocations to fully use project lands and considers public desires, legislative authority, regional and project-specific resource requirements, and suitability.

Management and use of the lands assigned to each land classification are discussed in connection with the appropriate resource objectives in the following section.

### **5.3. RESOURCE OBJECTIVES FOR SPECIFIC LAND CLASSIFICATIONS**

Resource objectives are attainable goals for resource development and/or management that are consistent with authorized project purposes, Federal laws and directives, regional needs, resource capabilities, and expressed public desires. These objectives provide a consolidation of the information presented in the previous chapters of this Master Plan. The resource objectives will be met, either wholly or partially, through the implementation of the site-specific resource objectives established for each management area described in the project's Operational Management Plan. The resource objectives that were developed for each land classification at the Gavins Point project and the rationale used to develop the objectives are provided below.

#### **5.3.1. Project Operations Lands**

This classification includes lands required for the dam and associated structures, operations center, administrative offices, maintenance compounds, and other areas that are used to operate and maintain the Gavins Point Dam/Lewis and Clark Lake project. Where compatible with operational requirements, Project Operations lands may be used for wildlife habitat management, recreational use, or agricultural activities. Licenses, permits, easements, or other outgrants are issued only for those uses that do not conflict with operational requirements. Approximately 300 acres of land are classified as Project Operations.

Resource Objectives. Resource objectives for Project Operations lands include the following:

- Maintain and operate project structures in a manner that allows them to effectively fulfill project purposes;
- Provide for public use of project structures where such use is feasible and does not interfere with other project purposes; and
- Provide an adequate area for maintenance facilities that are required to meet overall project objectives.

**Rationale.** The Gavins Point Dam/Lewis and Clark Lake project is a component of the Missouri River main stem system of dams that are operated for flood control, navigation, hydropower, fish and wildlife, recreation, municipal and industrial water supply, and irrigation.

Most of the major Project Operations lands at the Gavins Point Dam/Lewis and Clark Lake project are clustered at the southern end of the reservoir. The operation and maintenance of the Gavins Point Dam is the primary purpose of these lands. Uses that interfere with operational activities, compromise the structural integrity of the project or its facilities, or create a safety hazard for visitors or project personnel cannot be allowed. Within these constraints, Project Operations lands provide important opportunities for visitor use, interpretation, and wildlife management.

Reservoir operation is outside the scope of the Master Plan. However, operation of the lake in accordance with its authorized purposes forms the basis for many of the project-wide and management area resource objectives and the management and development concepts that are presented. Future changes to the reservoir plan of operation may negatively impact some project purposes or objectives while others may benefit.

### **5.3.2. Recreation Lands**

These lands are designated for intensive levels of recreational use to accommodate and support the recreational needs and desires of project visitors. They include lands on which existing or planned major recreational facilities are located and allow for developed public recreation facilities, concession development, and high-density or high-impact recreational use. Approximately 2,295 acres of land at the Gavins Point Dam/Lewis and Clark Lake project are classified as Recreation.

In general, no uses of these lands are allowed that would interfere with public enjoyment of recreation opportunities. Low-density recreation and wildlife management activities compatible with intensive recreation use are acceptable, especially on an interim basis. No agricultural uses are permitted on those lands except on an interim basis for maintenance of scenic or open space values. Permits, licenses, and easements are not issued for non-compatible manmade intrusions such as pipelines, overhead transmission lines, and non-project roads, except where warranted by the public interest.

Resource Objectives. Resource objectives for Recreation Lands include providing for camping opportunities, separate day use opportunities, opportunities for several activities in the same general vicinity, lake access for boats, concessionaire marina facilities and services, opportunities for the elderly and handicapped to participate in a variety of activities, and trees for shade and for wildlife use, as well as to control shoreline and soil erosion.

Rationale. The location and design of recreation areas and facilities takes into account the desired recreation experience. Criteria such as spacing, buffer zones, vegetative screening, and other considerations are used in the design of recreation facilities to ensure that visitors have adequate access to the lake and quality recreational experiences. A basic objective of the Corps' master planning process is to provide the best possible combination of resource uses and management options to meet the needs of the public. In part, this is accomplished by emphasizing the particular qualities, characteristics, and potentials of a given area or group of areas within the project.

### **5.3.3. Mitigation Lands**

This classification includes those lands specifically designated to offset habitat losses associated with the development of the Gavins Point Dam/Lewis and Clark Lake project. No lands are currently classified as mitigation lands at the project.

Resource Objectives. Resource objectives for Mitigation lands include the following:

- Provide and maintain high quality and diverse vegetation resources to provide food and shelter for wildlife;
- Maintain and improve quality and diversity of vegetation resources to conserve soil resources;
- Ensure that no degradation or net loss of wetland areas occur; and
- Provide wildlife habitat on all suitable lands.

Rationale. Design Memorandum M (Gen) 19, approved by the Missouri River Division in December 1987, details implementation plans for Lewis and Clark Lake wildlife mitigation. The plan identifies habitat areas within the project that should be managed for wildlife mitigation. These lands were

prioritized into two categories. Category I project lands have good potential for habitat improvement and relatively good road access. These lands also include some areas that are already managed as wildlife areas. The remainder of available project land, exclusive of lands managed as natural areas, are designated as Category II project lands. These lands have moderate to poor potential for habitat improvements and little or no road access. However, Category I and II designations are no longer used because some agencies are inaccurately relating the designation to the USFWS mitigation policy resource category designations.

#### **5.3.4. Environmentally Sensitive Areas**

This classification consists of areas where scientific, ecological, cultural, or aesthetic features have been identified. Development of public use on lands within this classification is normally limited or prohibited to ensure that the sensitive areas are not adversely impacted. Agricultural or grazing uses are not permitted on lands with this classification. One area at the project is classified as environmentally sensitive.

Resource Objectives. Resource objectives for Environmentally Sensitive lands include the following:

- Protect and preserve scientific, ecological, cultural, or aesthetic resource sites while meeting other project resource objectives;
- Ensure that no degradation or net loss of wetland areas occur;
- Preserve and/or restore wildlife habitat; and
- Provide a resource-oriented recreation opportunity in as natural an environment as possible.

Rationale. One area (Management Unit L03001E400, Knox to Lindy) around Lewis and Clark Lake has been designated as an environmentally sensitive area. Areas in this category have been designated in order to preserve and protect their natural resource values, scenic values, historic values, fish and wildlife habitat, and/or other special qualities. Although these areas are available for public use, many possess natural features that are managed for research and education purposes with minimal human intervention and impacts. Preservation, presentation, and interpretation are the primary management goals in these areas.

### **5.3.5. Multiple Resource Management Lands**

This classification, which contains approximately 12,069 acres, includes lands managed for one or more of the following activities.

Recreation-Low Density. These lands are designated for dispersed and/or low-impact recreation use. Approximately 4,552 acres of the Gavins Point Dam/Lewis and Clark Lake project lands are included in this sub-classification. Development of facilities on these lands is limited. Emphasis is on providing opportunities for non-motorized activities such as walking, fishing, hunting, or nature study. Site-specific, low-impact activities such as primitive camping and picnicking may be allowed. Some limited facilities are permitted, including boat ramps, trails, parking areas and vehicle controls, vault toilets, picnic tables, and fire rings.

Manmade intrusions, including powerlines, non-project roads, and water and sewer pipelines, may be permitted under conditions that minimize adverse effects on the natural environment. Vegetation management, including agricultural activities that do not greatly alter the natural character of the environment, are permitted for a variety of purposes, including erosion control, retention and improvement of scenic qualities, and wildlife management. Where not in conflict with the safety of visitors and project personnel, hunting and fishing are allowed pursuant to state and/or tribal fish and wildlife management regulations.

Wildlife Management General Lands. These lands are designated for wildlife management, although all project lands are managed for fish and wildlife habitat in conjunction with other land uses. Wildlife management lands contain valuable wildlife habitat components that are maintained to yield habitat suitable for a designated wildlife species or group of species. Approximately 7,517 acres of the Gavins Point Dam/Lewis and Clark Lake project lands are included in this sub-classification.

These lands may be administered by other public agencies under a lease, license, permit, or other formal agreement. Licenses, permits, and easements are not allowed for such manmade intrusions as pumping plants, pipelines, cables, transmission lines, or non-project roads. Exceptions to this policy are allowable where necessary for the public interest. Wildlife lands are available for sightseeing, wildlife viewing, nature study, and hiking. Consumptive uses of wildlife, including hunting, fishing, and trapping, are allowed when compatible with the wildlife objectives for a given area and with Federal and state fish and wildlife management regulations.

Vegetative Management. Management activities in these areas focus on the protection and development of forest resources and vegetative cover. The Gavins Point Dam/Lewis and Clark Lake project has no project lands with this sub-classification, but all project lands are managed to protect and develop vegetative cover in conjunction with other land uses.

Inactive and/or Future Recreation Areas. This sub-classification consists of lands for which recreation areas are planned for the future or lands that contain existing recreation areas that have been temporarily closed. The Gavins Point Dam/Lewis and Clark Lake project has no project lands with this sub-classification.

Easement Lands. This classification consists of lands for which the Corps did not acquire fee title but did acquire (1) the right to enter onto the property in connection with the operation of the Gavins Point Dam/Lewis and Clark Lake project and (2) the right to occasionally flood the property. Planned use and management of easement lands will be in strict accordance with the terms and conditions of the easement estate acquired for the project.

Resource Objectives. Resource objectives for Multiple Resource Management lands include the following:

- Provide trail opportunities for interpretive hiking;
- Accommodate and support non-consumptive resource uses such as hiking, bird watching, photography, nature study, wildlife observation, and/or the pursuit of peace and solitude;
- Employ good stewardship practices by increasing the use of soil conservation measures;
- Ensure successful natural propagation of diverse fish and wildlife species; and
- Provide sites for future development that are adjacent to existing recreation areas and within the project boundary and that meet anticipated outdoor-recreation demands. These sites must be appropriate for that area of the project and must not adversely impact project operations or other project purposes.

Rationale. In addition to the intensively developed recreation areas, less developed recreation areas are available for a wide variety of low-density, dispersed recreation uses. Boating, fishing, hunting, hiking, and other such uses support and complement this objective.



The project area provides many opportunities for a variety of dispersed recreation activities. Given the excellent walleye and northern pike fishing at Lewis and Clark Lake, fishing pressure is expected to increase. The project area contains a diversity of habitat types and wildlife species, including waterfowl, upland game birds, and big game species, so hunting is a major activity. The same diversity of habitats and wildlife make the Gavins Point Dam/Lewis and Clark Lake project an excellent location for wildlife viewing and photography.

## **6. RESOURCE PLAN**

### **6.1. INTRODUCTION**

The development of Gavins Point Dam/Lewis and Clark Lake project lands and resources must consider a wide variety of factors that have a direct or indirect impact on potential use. These factors include physical characteristics, land and lake access, compatibility with adjacent land uses, existing and projected visitation levels and visitor-use pattern, the economics of operation and maintenance, and state and local initiatives. It is vital that any future recreational development not destroy the very features of the project that visitors come to enjoy. Therefore, the overall objective in the development at the Gavins Point Dam/Lewis and Clark Lake project is to maximize the recreational benefits while preserving the area's natural resources and scenic qualities.

The Gavins Point project is organized into 59 management units (MUs). The 59 management units are presented in Table 6.1 and plates depicting their locations are included in Appendix A. Of these MUs, 15 are classified as primary, high intensity recreation areas. These areas range from fully developed campgrounds to primitive access points. Of the 15 high intensity recreation areas, 6 were transferred in fee title to the South Dakota Department of Game, Fish, and Parks through Title VI leaving 9 recreation units under Corps ownership. Of the 9 high intensity recreation management units under Corps ownership, one has been leased to the SDGFP in perpetuity in accordance with Title VI legislation. The areas have been divided into categories based on the land classification system described in Chapter 5.

The purpose of the Master Plan is to provide a long-range view of project development. As such, it is important to (1) examine the various segments of the lake and their potential for development and (2) examine each management area within the various segments and determine how each area can be developed to fit with the overall goals of the segments and the Gavins Point Dam/Lewis and Clark Lake project as a whole.

**Table 6-1. All Management Units**

| MU# | Name                           | Land Use Classification              | Ownership | Management               | Other  |
|-----|--------------------------------|--------------------------------------|-----------|--------------------------|--|
| 01  | Yankton Unit                   | Recreation <sup>1</sup>              | SDGFP     | SDGFP                    | Title VI Transfer  |
| 02  | Midway Unit                    | Recreation                           | SDGFP     | SDGFP                    | Title VI Transfer  |
| 03  | Gavins Point Unit              | Recreation                           | SDGFP     | SDGFP                    | Title VI Transfer  |
| 04  | Gavins to Lesterville          | Multiple Resource – RLD <sup>2</sup> | SDGFP     | SDGFP                    | Title VI Transfer  |
| 05  | Lesterville                    | Multiple Resource – RLD              | SDGFP     | SDGFP                    | Title VI Transfer  |
| 06  | Boy Scout Camp to Tabor        | Multiple Resource – WM <sup>3</sup>  | SDGFP     | SDGFP                    | Title VI Transfer<br>Boy Scout lease assigned to the SDGFP               |
| 07  | Tabor WM Unit                  | Multiple Resource – WM               | COE       | SDGFP                    | With Outgrants   |
| 08  | Tabor                          | Multiple Resource – RLD              | SDGFP     | SDGFP                    | Title VI Transfer  |
| 09  | Tabor to Charley Creek         | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 10  | Charley Creek                  | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 11  | Charley Creek to Twin Bridges  | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 12  | Twin Bridges                   | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 13  | Twin Bridges to Sand Creek     | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 14  | Sand Creek                     | Recreation                           | SDGFP     | SDGFP                    | Title VI Transfer  |
| 15  | Sand Creek to Springfield      | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 16  | Springfield Recreation Area    | Recreation                           | SDGFP     | SDGFP                    | Title VI Transfer<br>Springfield golf course lease assigned to the SDGFP |
| 17  | Springfield to Emanuel Creek   | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 18  | Emanuel Creek                  | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 19  | Emanuel Creek to Running Water | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 20  | Running Water                  | Multiple Resource – WM               | COE       | SDGFP                    | Lease in Perpetuity  |
| 21  | Running Water West             | Multiple Resource – WM               | COE       | SDGFP                    | With Outgrants   |
| 22  | Niobrara Island                | Multiple Resource – WM               | COE       | NGPC                     | With Outgrants   |
| 23  | West Niobrara                  | Multiple Resource – WM               | COE       | COE                      | With Outgrants   |
| 24  | Niobrara Recreation Area       | Recreation                           | COE       | NGPC/Village of Niobrara | With Outgrants   |
| 25  | Niobrara Lagoons               | Operations                           | COE       | Village of Niobrara      | With Outgrants   |
| 26  | East Niobrara/Bazile Creek     | Multiple Resource – WM               | COE       | NGPC                     | With Outgrants   |

**Table 6-1 (continued). All Management Units**

| <b>MU#</b> | <b>Name</b>                             | <b>Land Use Classification</b> | <b>Ownership</b> | <b>Management</b>          | <b>Other</b>   |
|------------|---|--------------------------------|------------------|----------------------------|----------------|
| 27         | Bazille Creek to Lost Creek             | Multiple Resource – WM         | COE              | NGPC                       | With Outgrants |
| 28         | West Santee                             | Multiple Resource – WM         | COE              | NGPC                       | With Outgrants |
| 29         | Santee                                  | Multiple Resource – RLD        | COE              | Santee Sioux Tribe         | With Outgrants |
| 30         | Santee to Knox                          | Multiple Resource – WM         | COE              | NGPC                       | With Outgrants |
| 31         | Knox to Lindy                           | Environmentally Sensitive Area | COE              | NGPC                       | With Outgrant  |
| 32         | Devil's Nest Frontage                   | Multiple Resource – RLD        | COE              | COE                        | With Outgrants |
| 33         | East Devil's Nest                       | Multiple Resource – WM         | COE              | COE                        | With Outgrants |
| 34         | East Devil's Nest - Miller Creek        | Multiple Resource – WM         | COE              | COE                        | With Outgrants |
| 35         | Miller Creek                            | Recreation                     | COE              | NGPC                       | With Outgrants |
| 36         | Miller Creek to Bloomfield              | Multiple Resource – WM         | COE              | NGPC                       | With Outgrants |
| 37         | Bloomfield Recreation Area              | Recreation                     | COE              | NGPC                       | With Outgrants |
| 38         | Bloomfield to Kohles Acres              | Multiple Resource – WM         | COE              | NGPC                       | With Outgrants |
| 39         | Kohles Acres Frontage                   | Multiple Resource – RLD        | COE              | COE                        | With Outgrants |
| 40         | Weigand, Burbach Recreation Area        | Recreation                     | COE              | NGPC                       | With Outgrants |
| 41         | Weigand to Walker's Valley              | Multiple Resource – WM         | COE              | NGPC                       | With Outgrants |
| 42         | Walker's Valley Frontage                | Multiple Resource – RLD        | COE              | COE                        | With Outgrants |
| 43         | Deep Water                              | Multiple Resource – RLD        | COE              | NGPC                       | With Outgrants |
| 44         | Mische Frontage                         | Multiple Resource – RLD        | COE              | COE                        | No Outgrants   |
| 45         | Hideaway Acres Frontage                 | Multiple Resource – RLD        | COE              | Hideaway Homeowners Assoc. | With Outgrants |
| 46         | South Shore Wildlife Area               | Multiple Resource – RLD        | COE              | COE                        | No Outgrants   |
| 47         | Hideaway to South Shore Recreation Area | Multiple Resource – WM         | COE              | NGPC                       | With Outgrants |
| 48         | South Shore Recreation Area             | Multiple Resource – RLD        | COE              | NGPC                       | With Outgrants |
| 49         | Crofton Golf Course                     | Recreation                     | COE              | City of Crofton            | With Outgrants |

**Table 6-1 (continued). All Management Units**

| MU# | Name                            | Land Use Classification | Ownership | Management | Other               |
|-----|---------------------------------|-------------------------|-----------|------------|---------------------|
| 50  | Maintenance Shop                | Operations              | COE       | COE        | With Outgrants      |
| 51  | Overlook and Tailwaters         | Recreation              | COE       | COE        | With Outgrants      |
| 52  | Dam, Power Plant, and Boat Yard | Operations              | COE       | COE        | With Outgrants      |
| 53  | NE Highway 121 R.O.W.           | Operations              | COE       | COE        | With Outgrants      |
| 54  | Chief White Crane               | Recreation              | SDGFP     | SDGFP      | Title VI Transfer   |
| 55  | USFWS Hatchery and Lake Yankton | Multiple Resource – WM  | COE       | USFWS      | With Outgrants      |
| 56  | Lake Yankton Island             | Multiple Resource – WM  | COE       | COE        | No Outgrants        |
| 57  | Downstream Day Use Areas        | Recreation              | COE       | COE        | With Outgrants      |
| 58  | Pierson Ranch                   | Recreation              | COE       | SDGFP      | Lease in Perpetuity |
| 59  | Cottonwood                      | Recreation              | COE       | COE        | No Outgrants        |

<sup>1</sup>/ Recreation = high-intensity recreation areas

<sup>2</sup>/ RLD = recreation (low density) areas

<sup>3</sup>/ WM = wildlife management

## 6.2. MANAGEMENT AREAS

The following sections provide specific information on each management unit under Corps ownership. Previously Corps-owned areas that were transferred in fee title to the SDGFP through Title VI are listed but are not described in detail as these units are now the responsibility of the State of South Dakota. The discussion of each Corps-owned management area contains the following components:

Management Unit Number: Management unit number (and Operational Management Plan number).

Land Use Classification: The designated land use classification category for each management area.

Location: A brief description of the location of the area, including access to the area.

Soils Information: A brief description of the soils classifications that occur within the management unit.

Vegetation: Description of management unit's vegetation characteristics.

Wildlife: Description of habitat, wildlife uses, and management objectives, if any, for wildlife.

Recreation: The predominant use of the area and where the majority of the visitation originates.

Past Management: This section includes a brief description of past management actions and history.

Real Estate Outgrants: States whether real estate outgrants exist within the management area.

An environmental assessment (EA) addressing the impacts of the implementation of the Master Plan has been included in Appendix B.

A total of 59 units have been designated within the lands that comprise Lewis and Clark Lake. The starting point for the unit descriptions is immediately upstream of the dam at the Yankton unit (MU #1), now owned and operated by the State of South Dakota. Units proceed west from this area and continue around the lake in a counterclockwise fashion before terminating below the dam in the downstream recreation area at the Cottonwood unit (MU #59). Management plans, including dollar estimates for implementation, are developed for those units that the Corps of Engineers directly manages and are presented in the project's Operational Management Plan.

### **6.2.1. YANKTON Management Unit**

PREVIOUSLY MANAGEMENT UNIT NUMBER: 01 (OMP # L001010200)

Transferred to SDGFP per Title VI. A small parcel of land was retained in fee by the Corps along the Dam abutment. It was leased in perpetuity.

### **6.2.2. MIDWAY Management Unit**

PREVIOUSLY MANAGEMENT UNIT NUMBER: 02 (OMP # L002010200)

Transferred to SDGFP per Title VI.

### **6.2.3. GAVINS POINT Management Unit**

PREVIOUSLY MANAGEMENT UNIT NUMBER: 03 (OMP # L003010200)

Transferred to SDGFP per Title VI.

### **6.2.4. GAVINS TO LESTERVILLE Management Unit**

PREVIOUSLY MANAGEMENT UNIT NUMBER: 04 (OMP# L004010502)

Transferred to SDGFP per Title VI.

### **6.2.5. LESTERVILLE Management Unit**

PREVIOUSLY MANAGEMENT UNIT NUMBER: 05 (OMP # L005010502)

Transferred to SDGFP per Title VI.

### **6.2.6. BOY SCOUT CAMP TO TABOR Management Unit**

PREVIOUSLY MANAGEMENT UNIT NUMBER: 06 (OMP # L006010502)

Transferred to SDGFP per Title VI. Boy Scout lease was assigned to the SDGFP.

### **6.2.7. TABOR Wildlife Management Unit**

MANAGEMENT UNIT NUMBER: 07 (OMP # L006010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad map Bon Homme Colony and Tabor SE, Bon Homme County and Yankton County, South Dakota, Township 93 North, Range 57 West, Sections 17, 18, 19, and 24.

**SOILS INFORMATION:** Soils are of the Ethan-Boyd-Thurman association. These are moderately steep soils on upland ridges and drainages which are well suited for native grasses and trees. They are generally too steep and unsuitable for cultivation, building sites or road construction. For more specific information refer to the Yankton and Bon Homme County soil surveys.

**VEGETATION:** A large portion of this unit is mixed native grasses and perennial shrubs. The confluence of two large draws occurs in this unit and it is densely vegetated with cedar-oak tree species as well as a variety of woody shrubs. Smooth brome grass has invaded disturbed areas in the unit such as the roadsides, parking lot perimeter as well as the picnic and day-use areas.

**WILDLIFE:** This area is extensively utilized by a variety of wildlife species including songbirds, turkey, rabbit, pheasant, squirrel, raptors, and a high population of whitetail deer.

**RECREATION:** The primary recreational use in this unit is hunting both small game such as furbearers and pheasant as well as larger game, namely whitetail deer.

**PAST MANAGEMENT:** This unit has been outgranted to South Dakota and is managed as part of their fish and wildlife resource license.

**REAL ESTATE OUTGRANTS:** The area is outgranted to the State of South Dakota.

**6.2.8. TABOR RECREATION AREA Management Unit**

**PREVIOUSLY MANAGEMENT UNIT NUMBER:** 07 (OMP # L007010501)



Transferred to SDGFP per Title VI.

### **6.2.9. TABOR TO CHARLEY CREEK Management Unit**

MANAGEMENT UNIT NUMBER: 09 (OMP # 0008010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Bon Homme Colony, Bon Homme County, South Dakota, Township 93 North, Range 58 West, Sections 16, 17, 18, 20, 21, 22, and 23. The eastern portions of this unit consist of a thin strip of land along the lake and the Bon Homme Hutterite Colony and the western portions include some larger tracts of land which encompass shallow drainages.

SOILS INFORMATION: Soils are of the Eltree Yankton Alcester association. In general the soils in this unit are well-suited for vegetative plantings with the exception of those that are too steep for cultivation. For more specific soils information refer to the Soil Survey of Bon Homme County, South Dakota.

VEGETATION: This unit contains mostly a combination of native mixed grass species along its approximately four-mile reach. Scattered cedar oak draws occur along its area and the shallow drainages contain mostly cottonwood, elm, and ash woody tree species combined with a variety of woody shrubs. Cultivated tree, shrub, dense nesting cover, and food plots have been planted and maintained by a lessee under a rental abatement program associated with an agricultural lease in the unit. Corps-managed lands located east of the colony have been subjected to heavy grazing pressure by the lessee in connection with the rental abatement but over time the grasses should recover given adequate moisture and lack of competition.

WILDLIFE: This area is extensively utilized by a variety of wildlife species including rabbit, pheasant, squirrel, raptors, and a high population of whitetail deer and turkey.

RECREATION: The primary recreational use in this unit is hunting both small game such as furbearers and pheasant as well as larger game, namely whitetail deer.

**PAST MANAGEMENT:** This unit is managed by the Corps and has in the past been developed for wildlife production through the use of a rental abatement with an agricultural lessee, the Bon Homme Brethren. There are easements for irrigation intakes and power lines as well as a flowage easement up the Charley Creek drainage. (Note: This unit contains Charley Creek. The drainage leading into the Charley Creek Area, in unit nine, has no name).

Two settling ponds associated with a hog operation at the Bon Homme Colony have been identified as a potential water quality hazard because of their close proximity to Lewis and Clark Lake. If shoreline erosion in this stretch of the lake continued unchecked the ponds could have potentially failed and spilled their contents into the lake. Bank stabilization work was carried out in 1991 by the Corps to rectify this situation. Land was surveyed and purchased in this area to accommodate the work that was done and to replace what was lost to past erosion. Land located along this stretch of the lake shoreline is highly disturbed from earth-moving activities and slopes contain a mixture of annual weedy vegetation.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.10. CHARLEY CREEK Management Unit**

**MANAGEMENT UNIT NUMBER:** 10 (OMP # 00009010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad maps Bon Homme Colony and Santee (Nebraska), Township 93 North, Range 58 West, Section 18, and Township 93 North, Range 59 West, Section 13, in Bon Homme County, South Dakota. This unit is the Charley Creek Recreation Area.

**SOILS INFORMATION:** Soils are of the Eltree Yankton Alcester association. In general the soils in this unit are well suited for vegetative plantings with the exception of those that are too steep for cultivation. For more specific soils information refer to the Soil Survey of Bon Homme County, South Dakota.

**VEGETATION:** This unit contains mostly a combination of native mixed grass species as well as introduced stands of warm- and cool-season grasses seeded by the project. The shallow drainage contains mostly cottonwood, elm, and ash woody species combined with a variety of woody shrubs. Cultivated tree, shrub, dense nesting cover, and food plots have been planted and are maintained by the Corps for wildlife purposes. Some land contained within portions of the creek drainage flowing through this unit stay semi-saturated during the spring and other wet periods. Cattails, reeds, sedges, and other hydrophytic plant communities exist in these soils.

**WILDLIFE:** This area is extensively utilized by a variety of wildlife species including rabbit, pheasant, squirrel, raptors, whitetail deer, and turkey.

**RECREATION:** The recreation that occurs within this unit is mainly confined to swimming at a small beach in the area, picnicking, primitive camping, and hunting. Some non-consumptive recreation such as bird watching, hiking, photography, and other uses probably occur although infrequent in nature. A boat ramp does exist in the unit but is not functional due to sedimentation and littoral drift across the drainage area at the mouth of the creek as it enters Lewis and Clark Lake.

**PAST MANAGEMENT:** The unit has been managed as a low use recreation area and was intended for that purpose in past plans for the lake. Sedimentation problems and littoral drift in the area have begun a delta formation such that boaters cannot reach the bay except at maximum operating pool because of shallow off shore water. Several existing environmental shelterbelt plantings have been improved through pruning to stimulate new growth. In addition, food plots and dense nesting cover crops such as native tall grasses have been planted in the unit to provide habitat diversity. Shoreline erosion is extensive in this unit and continues to cut vertical banks throughout the area.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.11. CHARLEY CREEK TO TWIN BRIDGES Management Unit**

**MANAGEMENT UNIT NUMBER:** 11 (OMP # 0010010502)

## LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

**LOCATION:** Management unit is on USGS quad maps Santee (NE) and Tyndall (SD) Bon Homme County, South Dakota, Township 93 North, Range 59 West, Sections 10, 11, 13, and 14. The area is a thin strip of land bordered by Snatch Creek on the west and on the east by Charlie Creek.

**SOILS INFORMATION:** Soils are of the Eltree Yankton Alcester association. In general the soils in this unit are well suited for vegetative plantings with the exception of those that are too steep for cultivation. For more specific soils information refer to the Soil Survey of Bon Homme County, South Dakota.

**VEGETATION:** This unit contains some remaining native mixed grass species along its approximately two-mile reach. The majority of the area, however, consists of smooth brome grass introduced after past farming practices ended with the construction of the dam and subsequent land acquisition by the Corps. Scattered cedar oak draws occur along its area and the shallow drainages contain mostly cottonwood, elm, and ash woody tree species combined with a variety of woody shrubs.

**WILDLIFE:** This area is utilized by a variety of wildlife species including pheasant, grouse, rabbit, squirrel, and other fur-bearing species along with whitetail deer.

**RECREATION:** This unit is a thin strip of land that at present has little recreation taking place on it with the exception of hunting activities in the fall and winter seasons. The area is in proximity of roads that provide good access to it and has the potential to tie together the units of Snatch and Charlie Creek as a consolidated wildlife area. Some fishing occurs in the area and a small parking lot and portable boat ramp at a location informally referred to as the Bon Homme area supports these activities.

**PAST MANAGEMENT:** Portions of the unit have been managed through the use of an agricultural lease rental abatement program which maintained wildlife food plots in this area. Several portions of the management unit boundary have been lost or are in danger of being lost due to shoreline erosion along the unit, which is rather narrow in this reach of the lake.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for

current details on outgrants.

### **6.2.12. TWIN BRIDGES Management Unit**

MANAGEMENT UNIT NUMBER: 12 (OMP # 0011010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Tyndall, Bon Homme County, South Dakota, Township 93 North, Range 59 West, Section 10. This unit is referred to as the Snatch Creek area. The project boundary takes in a shallow drainage that is complemented to the north by a large flowage easement that encompasses an area approximately equivalent to a quarter section of land.

SOILS INFORMATION: Soils are of the Eltree Yankton Alcester association. In general the soils in this unit are well suited for vegetative plantings with the exception of those which are too wet and subject to flooding. A large percentage of the land bordering the drainage is classified as Lamo silt loam which rates fair to good in potential for wildlife habitat development. For more specific soils information refer to the Soil Survey of Bon Homme County, South Dakota.

VEGETATION: This unit contains mostly a combination of native mixed grass species. The shallow drainage contains mostly cottonwood, elm, and ash combined with a variety of woody shrubs. Cultivated tree belts, dense nesting cover, and food plots have been planted and are maintained by the Corps for wildlife purposes. Much of the land contained within portions of the creek drainage flowing through this unit stay semi-saturated during the spring and other wet periods, permitting cattails, reed grass, sedges, and other hydrophytic plants to exist on these soils.

WILDLIFE: This unit supports a wide diversity of wildlife species because of the natural and cultivated vegetation present in the area. Small game such as pheasant, grouse, partridge, rabbit, and fox, as well as non-game animal species like songbirds, seek food and cover in this unit which is surrounded by cultivated farmland. The unit supports whitetail deer and also some waterfowl due to the wetland nature of the soils.

**RECREATION:** Some use of this unit is made by fishermen, sunbathers, and swimmers who utilize a small beach area that is available during lower operating pool elevations. This area on the South Dakota side of the lake, as of this writing, represents the downstream progression of the delta formation within the lake. This is significant because the delta restricts recreational boating across the entire lake at this point. Only shallow draft vessels and those persons familiar with the small channels existing through the sandbars are able to navigate to areas on the lake further upstream. Hunting is a popular activity in the fall and winter months because of the roadside access to the area, and the habitat that lends itself to production and concentration of several game species.

**PAST MANAGEMENT:** In the past, several environmental shelterbelt plantings were developed for wildlife habitat. In addition, food plots and dense nesting cover crops such as native tall grasses have been planted in the unit to provide for wildlife enhancement. The high water table and seasonal flooding conditions that are relative to this unit preclude the development of sanitary facilities or other structures in most of its area. The continued development of wildlife habitat has been the main focus of management in this unit. The highway bridge supports within this unit have been protected with riprap material to reduce the effects of erosion.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.13. TWIN BRIDGES TO SAND CREEK Management Unit**

**MANAGEMENT UNIT NUMBER:** 13 (OMP # 0012010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad maps Tyndall (SD) and Santee (NE), Bon Homme County, South Dakota, Township 93 North, Range 59 West, Sections 15 and 16. This unit is bordered on the east by Snatch Creek and on the west by Sand Creek.

**SOILS INFORMATION:** Soils are of the Eltree Yankton Alcester association. In general the soils in this unit are well suited for vegetative plantings with the exception of those that are too steep for cultivation. For more specific soils information refer to the Soil Survey of Bon Homme County, South Dakota.

**VEGETATION:** This unit contains mostly a combination of native mixed grass species and introduced grasses along its approximately one-mile reach. Scattered cedar oak draws occur throughout the area, and the shallow drainages contain mostly cottonwood, elm, and ash combined with a variety of woody shrubs.

**WILDLIFE:** This area is utilized by a variety of wildlife species including pheasant, grouse, rabbit, squirrel, and other fur-bearing species along with whitetail deer. Migrating waterfowl make use of some portions of this area, primarily the shallow water along the shoreline of the unit. Sandbar islands located within this stretch of the lake have been used by threatened and endangered piping plover and interior least tern shorebirds.

**RECREATION:** There is not high use of this unit by visitors for recreation due in part to its appearance as private land as a large portion has been under an agricultural lease rental abatement program. The terrain is somewhat rugged and roads in the area are just dirt trails leading to points along the lakeshore. It serves as a buffer between the two more utilized access areas of Sand and Snatch creek but could be an important link between the two in the future. Some hunting and fishing takes place on this unit though it is hard to gauge an accurate number of visitors without traffic counter data.

**PAST MANAGEMENT:** This unit is managed by the Corps and has been developed for wildlife production in the past through the use of a rental abatement with an agricultural lessee. There are several easements for irrigation intakes, electrical lines, and a road. Some portions of the boundary have been lost and have been or will need to be reestablished in the future if wildlife habitat is to be developed.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.14. SAND CREEK Management Unit**

PREVIOUSLY MANAGEMENT UNIT NUMBER: 13 (OMP # L013010200)

Transferred to SDGFP per Title VI.

#### **6.2.15. SAND CREEK TO SPRINGFIELD Management Unit**

MANAGEMENT UNIT NUMBER: 15 (OMP # 0014010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Santee (NE), Bon Homme County, South Dakota, Township 93 North, Range 59 West, Sections 17, 18, and 19. This unit is a thin strip of land between the Springfield recreation area and Sand Creek recreation area.

SOIL INFORMATION: Soils are of the Eltree Yankton Alcester association. In general the soils in this unit are well suited for vegetative plantings with the exception of those that are too steep for cultivation. There are several portions of the shoreline in this area that are eroding at a fairly rapid pace leaving vertical cutbanks in many locations. For more specific soils information refer to the Soil Survey of Bon Homme County, South Dakota.

VEGETATION: This unit contains a mixture of mature stands of oak, cedar, ash, and elm with several woody shrub species interspersed with grass clearings. The fairly rugged terrain consists of steep hills and sharp drainages to the lake.

WILDLIFE: This area is utilized by a variety of wildlife species including pheasant, grouse, rabbit, squirrel, and other fur-bearing species along with whitetail deer. Migrating waterfowl make use of some portions of this area, primarily the shallow water along the shoreline of the unit.

RECREATION: The primary use of this unit is by wildlife as it serves as both a wildlife corridor along the lake shoreline and a food and cover area on a yearlong basis. Hunting is a recreational activity during the fall and winter months in this stretch of the lake and a primitive trail provides access through the area.



**PAST MANAGEMENT:** Management of this unit has been limited to the inspection and administration of outgrants, monitoring of erosion problems, and boundary resurvey. Some boundary corners have been lost and erosion has progressed onto private property of landowners adjacent to project lands. Cabin sites located in the western part of the unit known locally as Dempster's Cove were identified in 1978 as encroaching onto Corps-managed lands and were referred to Real Estate for action which is pending as of this writing.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.16. SPRINGFIELD RECREATION AREA Management Unit**

**PREVIOUSLY MANAGEMENT UNIT NUMBER:** 16 (OMP # L015010200)

Transferred to SDGFP per Title VI. Springfield golf course lease was assigned to the SDGFP.

#### **6.2.17. SPRINGFIELD TO EMANUEL CREEK Management Unit**

**MANAGEMENT UNIT NUMBER:** 17 (OMP # 0016010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad map Springfield, Bon Homme County, South Dakota, Township 93 North, Range 60 West, Sections 24 and 26. This unit is located between the Springfield Recreation Area and Emanuel Creek.

**SOILS INFORMATION:** Soils are of the Ethan Boyd Thurman association. They are easily eroded and in this unit form a thin strip of land with vertical cutbanks. For more information refer to the Soil Survey of Bon Homme County, South Dakota.

**VEGETATION:** This unit contains mostly a combination of native mixed grass species along

its eastern reach. Scattered cedar oak draws occur along this area and the drainages contain mostly cottonwood, elm, and ash tree species combined with a variety of woody shrubs. Portions of the unit closer to the mouth of Emanuel Creek contain increasing percentages of woody vegetation as the environment changes from grassland to woodland.

**WILDLIFE:** Much of this unit is simply a thin band of land between the lake and frontage of the city of Springfield. It serves as a corridor for wildlife such as deer to traverse the distance between other units and has some cover and draws that contain food sources. The unit is a wintering area for the bald eagle and other raptors such as hawks utilize the area on a year-round basis. This area is also used by a variety of wildlife species including pheasant and grouse, rabbit, squirrel, and other fur-bearing species. Sandbar islands that intermittently form in this stretch of the lake have been used by threatened and endangered piping plover and interior least tern shorebirds.

**RECREATION:** Hunting, hiking, and sightseeing are the main uses of this unit by the public. It offers splendid views of the lake and surrounding areas from the high bluffs just south of Springfield. Hunting use is confined to the fall season when waterfowl and upland game are the target species sought out by hunting parties.

**PAST MANAGEMENT:** The unit is managed by the Corps for wildlife management. An easement for the City of Springfield water intake line exists and is monitored annually for compliance by project personnel. There is extensive shoreline erosion occurring within this unit. One government boundary pin has been lost and several boundary pins are in danger of being lost due to caving banks.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

## **6.2.18. EMANUEL CREEK Management Unit**

**MANAGEMENT UNIT NUMBER:** 18 (OMP # 017010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad map Springfield, Bon Homme County, South Dakota, Township 93 North, Range 60 West, Sections 26 and 27. This is a tract of land located at the confluence of Emanuel Creek.

**SOILS INFORMATION:** Soils are of the Ethan Boyd Thurman association. They are well suited for environmental plantings and some of them are subject to seasonal flooding, particularly those lying adjacent to Emanuel Creek. For more information refer to the Soil Survey of Bon Homme County, South Dakota.

**VEGETATION:** The northeastern portion of this unit has fairly rugged terrain while the remainder of the unit is fairly flat within the floodplain of the creek. The unit is covered with mature stands of oak, cedar, ash, and elm trees along with several woody shrub species. The area near the mouth of the creek contains large amounts of sediment deposited both by the creek and through delta formation within the lake. The vegetation here is primarily a monoculture of cattails with a few other wetland plant species interspersed throughout the marsh area.

**WILDLIFE:** This unit has extensive wildlife resources and provides cover and food sources for a variety of different wildlife species. Several different food plots and nesting cover plots have been established and are maintained by the Corps in this unit. The unit is a wintering area for the bald eagle and other raptors such as hawks utilize the area on a year-round basis. This area is also used by a variety of wildlife species including pheasant, grouse, quail, rabbit, squirrel, and other fur-bearing species.

**RECREATION:** In the past, a boat ramp at this location was used by hunters and fishermen to access the lake and a small area was mown to provide parking just off the county road. This facility is now unusable due to siltation and sedimentation of the lakeshore at this location from the delta formation in the upper reach of Lewis and Clark. Hunting is the primary recreational activity in this unit.

**PAST MANAGEMENT:** A couple of small tracts of land within this unit were farmed in the past and were converted to food plots and dense nesting cover areas. Some survey work was

done to re- establish the government boundary in this unit and boundary fencing was installed to help prevent any future livestock encroachments from occurring in this area. The fence requires periodic maintenance, which is primarily the responsibility of the adjacent landowner but has also been performed by project personnel.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.19. EMANUEL CREEK TO RUNNING WATER Management Unit**

MANAGEMENT UNIT NUMBER: 19 (OMP # 0018010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Springfield, Bon Homme County, South Dakota, Township 93 North, Range 60 West, Section 34 and Township 92 North, Range 60 West, Sections 3, 9, 16, 17, 19, and 20. This unit is a very thin strip of land approximately five miles in length positioned between Emanuel Creek on the north and east and the Running Water frontage on the south and west.

SOILS INFORMATION: The predominant soils are those of the Fluvaquents Sarpy association that in general are very poorly drained and in much of the reach have water on or near the surface. There are some soils of the Ethan Boyd Thurman association as well, found for the most part on the upland sites and bluffs overlooking the floodplain in this area. For more information refer to the Soil Survey of Bon Homme County, South Dakota.

VEGETATION: Much of this unit is covered with cattail marsh and other types of marsh plants with some deeper pools of water remaining open and lacking vegetation. There are scattered groups of mature cottonwood trees and snags throughout the marsh found mostly on the soils of a higher elevation. A county road that runs the length of this unit somewhat divides the marsh type soils and vegetation on the lakeside from the upland vegetation growing on the bluffs to the landward side of the road. The upland sites contain mostly warm-season native and introduced grasses with cedar oak tree species scattered in the steep draws

and ravines.

**WILDLIFE:** This unit has extensive wildlife resources and provides cover and food sources for a variety of wildlife. There is an established great blue heron rookery located in an isolated location nearly  $\frac{3}{4}$  of a mile from the nearest road and surrounded by either the marsh or the present channel of the lake/river. The unit is a wintering area for the bald eagle and other raptors such as hawks and owls utilize the area year round. This area is also used by a variety of wildlife species including whitetail deer, pheasant, rabbit, mink, beaver, and other fur-bearing species. Waterfowl make use of some portions of this area, primarily the shallow water along the marsh edges and the open ponds. This area provides an ideal stopover location for ducks and geese during the spring and fall migratory seasons.

**RECREATION:** Sightseeing, bird watching, nature study, and hunting are the primary activities taking place in this unit. Some fishing activity takes place as well but is limited due to the shallow water and difficulty in navigating through marsh to the fishing spots.

**PAST MANAGEMENT:** Prior to 1993, the unit was under license to the State of South Dakota for fish and wildlife management purposes and little development has taken place in the unit. In 1993 the state relinquished management of this area back to the Corps, citing continual management problems due in part to the high water levels. A lack of upland habitat for management of wildlife, encroachments, weed control, and fence maintenance problems prompted the state to spend land management dollars elsewhere in South Dakota. Some noxious weed control has been performed in the past and there is a food plot and dense nesting cover plot that is maintained by an agricultural lessee under a share crop agreement. A highway bridge within this unit has received riprap material stabilization by the department of roads. The project boundary has been resurveyed and identified with standard pins and three miles of boundary are identified with carsonite markers.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.20. RUNNING WATER Management Unit**

**MANAGEMENT UNIT NUMBER:** 20 (OMP # 0019010501)

Leased in Perpetuity to SDGFP per Title VI.

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad map Springfield, Bon Homme County, South Dakota, Township 92 North, Range 60 West, Section 19. This unit is the Running Water frontage area.

**SOILS INFORMATION:** The predominant soils are those of the Fluvaquents Sarpy association that in general are very poorly drained and in much of the reach have water on or near the surface. There are some soils of the Ethan Boyd Thurman association as well, found for the most part on the upland sites and bluffs overlooking the floodplain in this area. For more information refer to the Soil Survey of Bon Homme County, South Dakota.

**VEGETATION:** Much of the area along the shoreline of this unit contains wetland plant species of cattail and other hydrophytic vegetation. Vertical cut banks lead from the water up to mostly cool- season grasses such as smooth brome in the disturbed areas and maintained turf grass species in the stretch along housing and cabin sites. Scattered and mixed tree species of elm, cottonwood, and ash occur on the upland sites in this unit.

**WILDLIFE:** This unit has little benefit for wildlife purposes other than those present for squirrel, rabbit, and songbirds and an occasional furbearer that utilize the limited resources of the area on a year-long basis. It serves as a corridor for wildlife such as deer to traverse the distance between other units and has some good cover that contains food sources.

**RECREATION:** The unit serves as an important access point to the lake in this area of the project with a boat ramp that remains open due to the swift current in the channel that helps to prevent siltation. Waterfowl hunting is a popular fall activity in the area and visitors utilize the boat ramp all year to launch boats for pleasure boating and for fishing the surrounding lake region.

**PAST MANAGEMENT:** Increased pressure has been placed on this unit due to the lack of other lake access within close proximity on the South Dakota side of the lake. In 1986 a small parking area was built, a new concrete boat ramp installed, and a vault toilet constructed to provide minimum service to meet the growing needs of this location. Local residents volunteer their time to maintain the facilities and to pick up litter and refuse from the area. Riprap

materials have been placed along the east boat ramp site to protect against wave action and stabilize the shoreline.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.21. RUNNING WATER WEST Management Unit**

MANAGEMENT UNIT NUMBER: 21 (OMP # L020010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad maps Springfield (SD) and Niobrara (NE), Bon Homme County, South Dakota, Township 92 North, Range 60 West, Section 19 and Township 92 North, Range 61 West, Sections 9, 14, 15, 16, and 24. This unit is bordered on the east by that part of the Running Water frontage lying west of Hwy. 37 and has its western border at the end of the Lewis and Clark Project boundary in the state of South Dakota.

SOILS INFORMATION: The predominant soils are those of the Fluvaquents Sarpy association that in general are very poorly drained and in much of the reach have water on or near the surface. There are some soils of the Ethan Boyd Thurman association as well, found for the most part on the upland sites and bluffs overlooking the floodplain in this area. For more information refer to the Soil survey of Bon Homme County, South Dakota.

VEGETATION: Much of the area along the shoreline of this unit contains wetland plant species of cattail and other hydrophytic vegetation. Vertical cut banks and bluffs lead from the water up to steep slopes with scattered and mixed tree species of elm, cottonwood, and ash on the upland sites in this unit. Cedar and oak species form dense tree cover in the drainages and draws. Grass species present in the area consist of a mixture of native and introduced cool- and warm-season types.

WILDLIFE: This area is also used by a variety of wildlife species including whitetail deer,

pheasant, rabbit, mink, beaver, and other fur-bearing species. Waterfowl make extensive use of some portions of this area, primarily the shallow water along the marsh edges and the open ponds. This area provides an ideal stopover location for ducks and geese during the spring and fall migratory seasons. Sandbar islands that intermittently form in this stretch of the lake have been used by threatened and endangered piping plover and interior least tern shorebirds.

**RECREATION:** An abandoned ferry landing located on the west end of the Running Water frontage provides access to the lake for waterfowl hunters and fishermen who wish to launch boats in this unit. The ferry has not operated as a commercial carrier since 1984 when passage across the lake and river channel at this location to just east of Niobrara, Nebraska could not take place because sedimentation and shifting sand bars made navigation too difficult. A bridge across the lake was built within this unit near the old ferry landing. It links to the Niobrara area (Unit 25).

**PAST MANAGEMENT:** The unit is currently licensed to the state of South Dakota for fish and wildlife purposes and has been under such an agreement since 1965. The agency has treated some sites in the unit for leafy spurge and thistles in accordance with state law. In the area near the ferry landing, residents volunteer time to keep the area clean and maintained and the state conservation officer periodically removes refuse and litter from the area. There has been extensive shoreline erosion within this unit that has resulted in the loss of one government boundary corner marker.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

## **6.2.22. NIOBRARA ISLAND Management Unit**

**MANAGEMENT UNIT NUMBER:** 22 (OMP # L021010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad maps Niobrara and Verdigre NE, Knox County, Nebraska, Township 32 North, Range 6 West, Sections 7, 8, 18, 19, and 30.



This unit is located at the mouth of the Niobrara River and encompasses what is referred to as the Niobrara Island and a portion of land just east of the river mouth. Part of the unit was the site of the Niobrara State Park before a rising water table forced relocation of the park to a new upland site.

**SOILS INFORMATION:** Soils are of the Inavale Barney Orwet association. These are deep and level, poorly drained sandy and loamy bottomland soils. Refer to the Soil Survey of Knox County for more specific soils information.

**VEGETATION:** The island area is located within an existing floodplain in which the water table is at or just below the soil surface. Vegetation consists of cool-season turf species, mixed native grasses, mature stands of cottonwood, and willow tree species and a variety of both naturally occurring and planted woody shrub species. There is a heavy infestation of purple loosestrife in this area and a protected backwater in the old park contains water lilies. Many of the trees in this unit are dying because of the rising water table and it is likely these trees will become snags.

**WILDLIFE:** This area is used by a variety of wildlife species including whitetail deer, pheasant, rabbit, mink, beaver, and other fur-bearing species. Waterfowl make some use of some portions of this area, primarily the shallow water along the marsh edges. Intermittent sandbars that form in the unit have been used by interior least tern and piping plover for nesting sites.

**RECREATION:** The primary use of this unit is fishing and hunting. Hiking and nature study activities do take place. An abandoned railroad grade and trestle across the Niobrara River in the unit has been improved by the Nebraska Game and Parks Commission and fishing from the bridge is popular. There is a parking area with a trailhead and vault toilet located on the east end of the unit.

**PAST MANAGEMENT:** The Nebraska Game and Parks Commission occupied this site prior to 1989 under a park and recreation lease. The area is presently managed by the commission through a wildlife license. Structures such as a maintenance garage, swimming pool, and related facilities formerly occupying the area were removed or demolished during the fall of 1992. Laundry and water treatment buildings were burned during the winter of 1991-92. Ten buildings located in the park were found to contain asbestos in the form of chimney flue

insulation and/or as vinyl asbestos floor tile during the process of excessing them through sale to the public. The asbestos was removed from the identified buildings in 1992 and will be offered for sale through a bidding process performed by the Omaha District Real Estate Office. Two of the cabins were found to contain asbestos in mastic form and will be dealt with in a different manner than the other eight structures.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.23. WEST NIOBRARA Management Unit**

MANAGEMENT UNIT NUMBER: 23 (OMP # 0022010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Niobrara, Knox County, Nebraska, Township 32 North, Range 6 West, Sections 8, 9, and 16. This unit is bounded on the west by an area leased to the Nebraska Game and Parks Commission and on the east by the Niobrara recreation area.

SOILS INFORMATION: Soils are of the Inavale Barney Orwet and Fluvaquents Albaton-Solomon association. These are deep and level, poorly drained soils consisting of sandy and loamy or silty and clayey materials, respectively.

VEGETATION: Much of the unit is made up of wetland plant species, including purple loosestrife, due to the high water table in this area. The remainder of the unit consists of cool-season turf species, mixed native grasses, stands of elm, cottonwood, and willow tree species, and a combination of both naturally occurring and planted woody shrub species. There had been an agricultural lease in this area with the lessee participating in a rental abatement program. In exchange for a portion of the lease payment, the lessee planted and maintained several wildlife food plots. A new lease to be established calls for converting former agricultural land to cover crops of alfalfa and grasses with annual haying for five years to control an increasing amount of shattercane developing in these areas. In addition to purple

loosestrife, leafy spurge has been identified and treated in this unit.

**WILDLIFE:** This unit has extensive wildlife resources and provides cover and food sources for a variety of different wildlife species. Several different food plots and nesting cover plots have been established and are maintained under the direction of the Corps of Engineers. This area is used by a variety of wildlife species including whitetail deer, pheasant, turkey, rabbit, squirrel, and other fur-bearing species.

**RECREATION:** Hunting and fishing are the primary recreational uses made of this unit but hiking, bird watching, sightseeing, and other outdoor nature study activities are also pursued. The unit has whitetail deer and is a stopover for migrating waterfowl which in turn attracts fairly heavy pressure and visitor use particularly in the fall months as visitors to the area seek out waterfowl hunting and fishing opportunities.

**PAST MANAGEMENT:** The unit has been managed for wildlife purposes and in the past some debris were removed from the old Niobrara town site that formerly occupied portions of the unit. The town was relocated by the Corps in 1978 because of a rising water table. The former gravel village roads are maintained to provide access into the area. Noxious weeds are controlled by the Corps and by an agricultural lessee as needed to comply with state and Federal regulations. Approximately 100 acres were leased for agricultural production in this unit beginning in 1993. Although past management had provided for this feature, the emphasis behind lease 93-6024 with R. Motacek was to grow and harvest alfalfa on certain portions of the lease area for a period of five years in an effort to rid these areas of shattercane. The idea behind this strategy was to control the production of seed from this annual plant and ensure that the seed bank within the area soils has been exhausted. Increasing problems with wet fields and marginal production due to rising water led to a decrease in the total acreage leased from 100 to only 60 acres by 1994.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.24. NIOBRARA RECREATION AREA Management Unit**

**MANAGEMENT UNIT NUMBER:** 24 (OMP # L023010200)

## LAND USE CLASSIFICATION: Recreation

**LOCATION:** Management unit is located on USGS quad map Niobrara, Knox County, Nebraska, Township 32 North, Range 6 West, Sections 9, 16, and 17. This unit is the Niobrara Golf Course/Recreation Area.

**SOILS INFORMATION:** Soils are of the Fluvaquents Albaton Solomon association. These are deep, level, and poorly drained silty clay soils found on bottomlands. Special construction techniques are needed to elevate structures, compact soil, or provide for drainage around buildings and structures located on these soils. Refer to the Soil Survey of Knox County, Nebraska for more specific information.

**VEGETATION:** This unit consists of mixed native grasses, smooth brome, and other introduced grasses, turfgrass species in the golf course areas, and some weed species such as leafy spurge that has been treated in the past. Stands of elm, cottonwood, and willow tree species and a combination of both naturally occurring and introduced woody shrubs can also be found in the area.

**WILDLIFE:** This unit has marginal benefit for wildlife at the present time. The mix of vegetation types and management provides habitat for squirrel, rabbit, songbirds, and an occasional furbearer that utilize the limited resources of the area on a yearlong basis. The unit does serve as a corridor for wildlife such as deer to traverse the distance between other units and has some good cover and food sources.

**RECREATION:** The main feature of this unit is a nine-hole golf course managed by the Village of Niobrara. The golf course is located on flat terrain and features mostly par 3 & 4 holes, some with elevated tees, grass greens, and sand traps. It is utilized primarily by local golfers.

**PAST MANAGEMENT:** A large part of this unit was formerly the location of the village of Niobrara before its relocation to adjacent lands out of the floodplain in 1978. The entire town was moved because of rising water tables in the area due to aggradation at the mouth of the Niobrara River and Lewis and Clark Lake.

The golf course was developed and is maintained by the Village of Niobrara. Two other portions of this unit are used for youth and sporting programs, the first being a 1.45-acre rodeo arena and grounds and the second consisting of three small tracts of land adjacent to school buildings which are leased to the Niobrara Board of Education for environmental education programs.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.25. NIOBRARA LAGOONS Management Unit**

MANAGEMENT UNIT NUMBER: 25 (OMP # L024010100)

LAND USE CLASSIFICATION: Operations

LOCATION: Management unit is located on USGS quad map Niobrara, Knox County, Nebraska, Township 32 North, Range 6 West, Section 9. This unit contains sewage lagoons and is located on land adjacent to the recreation area and boat ramp in unit 23.

SOILS INFORMATION: Soils are of the Fluvaquents Albaton Solomon association. These are deep, level, and poorly drained silty clay soils found on bottomlands. Special construction techniques are needed to elevate structures, compact soil, or provide for drainage around buildings and structures located on these soils. Refer to the Soil Survey of Knox County, Nebraska for more specific information.

VEGETATION: The vegetation in this unit consists of almost pure smooth brome and other introduced grasses with the exception of some weed species and volunteer trees that encroach upon the mown turf surrounding the lagoons.

WILDLIFE: Although not managed for wildlife resources, this area is used by some wildlife species including songbirds, pheasant, rabbit, mink, and other fur-bearing species.

RECREATION: This area is adjacent to a portion of the state wildlife lease and the recreation

area/golf course and is maintained by Niobrara for sewage treatment purposes.

**PAST MANAGEMENT:** Niobrara currently holds easements for the operation of sewage lagoons and a pump station with buried sanitary pipeline in this unit.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.26. EAST NIOBRARA/BAZILE CREEK Management Unit**

**MANAGEMENT UNIT NUMBER:** 26 (OMP # L025010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad maps Niobrara, Verdigre NE, Springfield and Sparta, Knox County, Nebraska, Township 32 North, Range 6 West, Sections 9, 10, 11, 12, 13, 14, 15, and 16. This is a large unit which encompasses land from the Niobrara Recreation Area, including the boat ramp there, east to the split of Rangeline five and six, just upstream of the confluence of Bazile Creek and the lake.

**SOILS INFORMATION:** Soils are of the Fluvaquents Albaton Solomon association. These are deep, level, and poorly drained silty clay soils found on bottomlands. Special construction techniques are needed to elevate structures, compact soil, or provide for drainage around buildings and structures located on these soils. There is also a small portion of the unit containing the Aowa Shell Kezan soil association found along the Bazile Creek drainage. Refer to the Soil Survey of Knox County for more specific information.

**VEGETATION:** The vast majority of surface acres in this unit are of the marsh and wetland type slough environment and contain cattail and other aquatic plants such as purple loosestrife. Ground at higher elevation in the unit supports native mixed grasses, trees such as cottonwood, ash, elm, and a variety of woody shrubs. Rising ground water levels are slowly converting many acres of remaining bottomland timber to wetland habitat and leaving standing dead timber.

**WILDLIFE:** This unit has extensive wildlife resources and provides cover and food sources for a variety of wildlife. Several raptors such as hawks and owls utilize the area on a year-round basis. This area is also used by a variety of wildlife species including whitetail deer, pheasant, quail, turkey, rabbit, mink, beaver, muskrat, and other fur-bearing species. Waterfowl make extensive use of some portions of this area, primarily the shallow water along the marsh edges and the open ponds. This area provides excellent habitat for ducks and geese during the spring and fall migratory seasons. Sandbar islands located within this stretch of the river have been used by threatened and endangered piping plover and interior least tern shorebirds.

**RECREATION:** Hunting and fishing are the primary recreational uses made of this unit but hiking, bird watching, sightseeing, and other outdoor nature study activities are also pursued. The unit contains high populations of whitetail deer and is a stopover for migrating waterfowl that in turn attract fairly heavy pressure and visitor use, particularly in the fall months. A boat ramp and related facilities located near the Niobrara golf course receives fairly heavy use during the summer and fall seasons as visitors to the area seek out waterfowl hunting and fishing opportunities. The ramp is one of only three ramps serving the upper portion of the lake along the Nebraska shoreline. A bridge across the lake connects this unit near the old ferry landing to the Running Water area (MU #20).

**PAST MANAGEMENT:** Much of this area is leased to the Nebraska Game and Parks Commission for fish and wildlife management. There are several shelterbelt tree plantings and food and cover plots that have been planted in this unit although it is becoming increasingly difficult to farm them except during dry years. Portions of the shoreline adjacent to the boat ramp have received riprap to protect the boat ramp and parking lot areas from any erosion problems. The boat ramp and parking area have in the past been dredged to remove sediment buildup and to raise the grade of parking and road access to ensure access during periods of high pool and inflows to the lake. There are annual expenditures for fence and sign maintenance as well as the control of noxious weeds throughout the wildlife management area. The state has an ongoing program to establish and maintain woodland clearings in the unit.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

## **6.2.27. BAZILE CREEK TO LOST CREEK Management Unit**

MANAGEMENT UNIT NUMBER: 27 (OMP # L026010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Springfield, Knox County, Nebraska, Township 32 North, Range 5 West, Sections 5, 7, 8, and 18 and Township 33 North, Range 5 West, Sections 22, 27, 28, and 33. This unit is bordered on the west by the Rangeline between 5 & 6 and on the east by the split between Township 33 North and Range 5 West, Sections 22 and 23. This area includes portions of Bazile Creek and the Lost Creek area. The western boundary of this unit also serves as the boundary of the Santee Indian Reservation.

SOILS INFORMATION: This unit represents a transition zone between the Fluvaquents-Albaton Solomon soils discussed in previous units and found in the western part of this unit and Labu Lynch Sansarc soils distributed in the eastern portions of this unit. The latter soils are moderately deep, strongly sloping, well drained, and clayey types found on upland sites.

VEGETATION: Many surface acres in the western portion of this unit are characterized by marsh and wetland vegetation consisting mainly of cattail sloughs. Rising groundwater levels are slowly converting many acres of land from upland woody vegetation to wetland species and leaving standing dead timber. Higher ground in the western portions of the unit supports native mixed grasses, trees such as cottonwood, ash, elm, and many woody shrub species. In the eastern portions of the unit, high bluffs follow the shoreline beginning just east of the Bazile Creek drainage and continue for several miles. Vegetation here consists of woody draws filled with an oak cedar tree community along with various rangeland plants and native grasses on the steeply sloping terrain.

WILDLIFE: This unit has extensive wildlife resources and provides cover and food sources for a variety of wildlife. Several raptors such as hawks and owls utilize the area year round. This area is also used by whitetail deer, pheasant, quail, turkey, rabbit, mink, beaver, muskrat, and other fur-bearing species. Waterfowl make extensive use of some portions of this area, primarily the shallow water along the marsh edges and the open ponds located mainly in the western part of the unit. These areas provide excellent habitat for ducks and geese during the spring and fall migratory seasons. Sandbar islands located within this stretch of the lake have



been used by threatened and endangered piping plover and interior least tern shorebirds.

**RECREATION:** Hunting and fishing are the primary recreational uses made of this unit as well as hiking, bird watching, sightseeing, and other outdoor nature study activities. The unit contains high populations of whitetail deer and migrating waterfowl in the western region where the terrain is characterized by floodplain vegetation and habitat. A boat ramp and small parking area that can be accessed by gravel road from Nebraska Highway 12 is located just upstream from the confluence of Bazile Creek and the lake.

**PAST MANAGEMENT:** The boat ramp, parking area, and gravel road are maintained to provide lake access but this area is frequently wet during periods of high pool and inflows to the lake. There are annual expenditures for fence and sign maintenance as well as the control of noxious weeds throughout the wildlife management area. The state has an ongoing program to establish and maintain woodland clearings in the unit. State personnel provide supervision and patrolling duties within the unit.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.28. WEST SANTEE Management Unit**

**MANAGEMENT UNIT NUMBER:** 28 (OMP # L027010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad map Santee, Knox County, Nebraska, Township 33 North, Range 5 West, Sections 14 and 23. This unit is bounded on the west by the split between Sections 22 and 23 in Township 33 North and Range 5 West and on the east by the split between Sections 13 and 14 in Township 33 North and Range 5 West.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County for more specific soils information.

**VEGETATION:** This unit consists of steep bluffs and rugged terrain that parallels the shoreline and has several deep drainages. Vegetation here consists of woody draws filled with an oak cedar tree community along with various rangeland plants and native grasses. The accumulation of sediment along the base of the bluffs and cut banks in this reach has resulted in shallow water depths. This condition has given rise to the growth of wetland plant species such as cattail and reed canary grass along with weedy types such as purple loosestrife.

**WILDLIFE:** This unit in association with adjacent private and tribal lands contains some good winter cover especially in the woody draws that also provide food sources. Waterfowl make extensive use of the shallow water along the marsh edges that have formed along the shoreline of this unit. This area provides excellent habitat for ducks and geese during the spring and fall migratory seasons.

**RECREATION:** Hunting for upland game and waterfowl as well as some shore fishing are the primary recreational uses made of this unit. Access to the area is severely limited by the terrain and the absence of roads. There is road/trail access in the extreme northeastern portion of the unit via a fair weather dirt road leading from Santee to a small, flat clearing along the river. There are no developed facilities at this location but there are sporadic day use activities such as picnicking and fishing at this location. This site is located approximately one mile west of County Road S54D that leads into the Santee Indian Reservation from Nebraska Highway 12.

**PAST MANAGEMENT:** The area is leased to the Nebraska Game and Parks Commission for fish and wildlife management. There are annual expenditures for fence and sign maintenance as well as the control of noxious weeds throughout the wildlife management area. The state has an ongoing program to establish and maintain woodland clearings in the unit. State personnel provide frequent supervision and patrolling duties within the unit.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.29. SANTEE Management Unit**

**MANAGEMENT UNIT NUMBER:** 29 (OMP # 0028010501)

**LAND USE CLASSIFICATION:** Multiple Resource – Recreation Low Density

**LOCATION:** Management unit is located on USGS quad map Santee, Knox County, Nebraska, Township 33 North, Range 5 West, Section 13 and Township 33 North, Range 4 West, Section 18. This unit runs along the frontage of Santee.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County for more specific soils information.

**VEGETATION:** The western portion of this unit consists of steep terrain covered with cedar, oak, and ash trees intermixed with woody shrubs in the draw areas and mixed native grasses which occur primarily on the ridge tops and severe slopes. The topography becomes less steep as you move eastward across the unit, turning to gently rolling to almost flat ground although the uplands are some twenty to thirty feet higher in elevation than a floodplain marsh that borders the lake. Vegetation in this eastern portion of the unit is made up of mixed native and introduced grasses with clusters of ash, elm, and cottonwood trees interspersed throughout its reach.

**WILDLIFE:** This unit provides some benefit to wildlife by serving as a buffer zone between the lake and the upland location of Santee. The mix of vegetation types and management provides habitat for small game and whitetail deer that utilize the resources of the area on a yearlong basis. The unit also serves as a corridor for wildlife to traverse the distance between other units and has some good cover and food sources. Waterfowl make use of the floodplain marsh areas during the annual migration periods.

**RECREATION:** A small camping area in the western part of this unit overlaps from Santee reservation lands onto the Corps-managed project land. This campground is rarely used except during an annual powwow, which is held by the tribe at an adjacent location. The gravel camp pads have electrical service to them but the water and sewer service to the area is no longer functional. Maintenance of the park is provided by tribal volunteers on an as-needed basis. There is a boat ramp and small gravel parking area located in the eastern portion of the unit that receives use mainly in the fall by waterfowl hunters.

**PAST MANAGEMENT:** The unit was in the past outgranted to the Nebraska Game and Parks Commission under a park and recreation lease but the entire area has been deleted from that instrument. The existing boat ramp in the eastern part of the unit has been difficult to keep open in the past because of sedimentation and littoral drift. The Santee Sioux Tribe at one point constructed a new ramp approximately 1/2 mile west of this location but it has since been abandoned. Improvements to the existing boat ramp by the Corps of Engineers seems to have resolved or at least lessened the sedimentation buildup at the mouth of the boat basin. Water coming downstream has been deflected away from the basin and sediment is now being deposited in the area immediately downstream of the ramp. There have been some encroachments in this area in the past but have been resolved through the permitting process and/or removal of the property. The jetty protecting the boat ramp in this unit has received riprap materials to protect it from shoreline erosion. An existing courtesy dock at the boat ramp is in poor condition and needs to be either repaired or removed.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.30. SANTEE TO KNOX Management Unit**

**MANAGEMENT UNIT NUMBER:** 30 (OMP # L029010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad map Santee, Knox County, Nebraska, Township 33 North, Range 4 West, Sections 17 and 18. This unit includes land from the Santee Lake Access Area east to the Knox area of Lewis and Clark Lake.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County for more specific soils information.

**VEGETATION:** Vegetation in the western portion of the unit is made up of mixed native and introduced grasses with clusters of ash, elm, and cottonwood trees interspersed throughout its reach. The eastern end of the unit is referred to as the Knox area and features a fairly large drainage that contains a cedar/oak plant community on upland sites as well as a wetland/wet

meadow plant community in the bottoms. A spring or seep exists in the latter area that feeds runoff into the lower portions of the drainage that results in the presence of the aforementioned plant species.

**WILDLIFE:** This unit supports a wide diversity of wildlife species because of the natural and cultivated vegetation present in the area. Small game such as pheasant, quail, partridge, rabbit, fox, and non-game animal species seek food and cover in this unit that is bordered by rangeland.

**RECREATION:** There are no developed recreation facilities within this unit that has limited access across an infrequently maintained gravel road and dirt trail. Local hunters and fishermen can utilize the wildlife resources of the unit either through the consent of adjacent landowners to cross private property or by accessing the area via boat from the lake.

**PAST MANAGEMENT:** The unit is managed by the Nebraska Game and Parks Commission for wildlife purposes through a license from the Corps of Engineers. There is a cabin development in the eastern portion of the unit and a gravel road to access the cottages. This road lies right along and adjacent to the Corps project boundary.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.31. KNOX TO LINDY Management Unit**

**MANAGEMENT UNIT NUMBER:** 31 (OMP # L03001E400)

**LAND USE CLASSIFICATION:** Environmentally Sensitive Area

**LOCATION:** Management unit is located on USGS quad maps Santee and Bon Homme Colony, Knox County, Nebraska, Township 33 North, Range 4 West, Sections 14, 15, 16, 23, and 24. This unit runs from the Knox area east to the Range 4 West Range line. It includes the Lindy area.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County (Schulte *et al.* 1997) for more specific soils information.

**VEGETATION:** This unit consists of steep bluffs and rough terrain that has several deep drainages. Woody vegetation is restricted to the draws which contain an oak cedar tree community intermixed with various other shrubs. The ridges and open areas contain mostly native grasses and forbs. An exception to this topography is the Lindy area that is a heavily wooded tract of land in the eastern portion of the unit. This tract of land contains cottonwood, willow, ash, and oak trees and an abundance of woody shrubs that have adapted to the periodically flooded low areas of Cooks Creek. Beaver activity and naturally occurring springs further up the Cooks Creek drainage create a distinct diversity of vegetation in comparison with the surrounding land area.

**WILDLIFE:** Wildlife abounds in this unit, primarily within the pocket of land in the Lindy area. The spring-fed stream and constant flow of water attract whitetail deer and other upland game to the area from surrounding range and farmland. This unit features an established double-crested cormorant rookery located along the shoreline in broken snag trees in the shallow waters of the lake. The cormorants at this site also utilize both live and dead standing trees located on the upland bluffs for nesting. Several types of raptors are found in this area as well as green heron, wood ducks, and other waterfowl.

**RECREATION:** The remoteness and lack of roads to this unit limits its use for recreational opportunities. Access by boat or across private property with landowner permission are the only practical methods to reach this unit. The terrain is extremely rugged but willing individuals could walk or hike through the area from either end of unit. Hunting both upland game and whitetail deer are the most common recreational pursuits within the unit.

**PAST MANAGEMENT:** The area is managed by the Nebraska Game and Parks Commission under a park and recreation lease. No specific management practices have been identified for this area. The Lindy area has a history of cattle encroachments from adjacent landowners' livestock. The boundary fence in this area is in poor condition and cattle enter project lands from both sides of Cooks Creek.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for

current details on outgrants.

### **6.2.32. DEVIL'S NEST FRONTAGE Management Unit**

MANAGEMENT UNIT NUMBER: 32 (OMP # 0031010501)

LAND USE CLASSIFICATION: Multiple Resource – Recreation Low Density

LOCATION: Management unit is located on USGS quad map Bon Homme Colony, Knox County, Nebraska, Township 33 North, Range 3 West, Section 19 and part of Section 20. This unit is bordered on the west by the Range 4 West Range line and on the east by the approximate confluence of Devil's Nest Creek and Lewis and Clark Lake.

SOILS INFORMATION: Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County (Schulte *et al.* 1997) for more specific soils information.

VEGETATION: This unit consists of steep bluffs and rugged terrain that has several deep drainages. Woody vegetation is restricted to the draws, which contain an oak cedar tree community intermixed with various other woody shrubs. The ridges and open areas contain mostly native mixed grasses and forbs. The extreme eastern part of this unit at the Devil's Nest Creek and the Birdsell Creek drainage contain wetland plant species along the bottomland with willow, cottonwood, dogwood, ash, and other woody plant species not typically found in the surrounding range.

WILDLIFE: This unit provides some benefit to wildlife by serving as a buffer zone between the lake and the upland Devil's Nest residential development. The mix of vegetation types and management provides habitat for game species, especially turkey and whitetail deer, that utilize the resources of the area on a yearlong basis.

RECREATION: The western portion and extreme eastern edge of this unit is well suited for deer and upland game hunting. However, use is relatively low due to the difficulty involved

in accessing the area. The eastern portion of this unit consists of a thin strip of land that borders the Devil's Nest residential development. This area has very steep slopes and is of little recreational value other than sightseeing or hiking. There is a marginal boat ramp located in this unit but due to the shallow offshore water depths it is virtually unusable except to small watercraft.

**PAST MANAGEMENT:** The unit was managed in the past under a wildlife license to the Nebraska Game and Parks Commission. A portion of the area was deleted from that license in 1992 and is now managed by the Corps of Engineers. Some interest has been expressed by the Devil's Nest homeowner association in obtaining a lease or license to manage the area around the boat ramp and basin. The interest is in regulating to a certain extent the general public's use of the area for beer parties and to deter some of the vandalism and associated problems that have occurred at that particular location in the past.

Access roads leading to the boat ramp and throughout the development itself are posted as private. However, Knox County has declared an unimproved access road leading off the paved entrance road within Devil's Nest as a designated township road. This road is located in the eastern half of Section 19, Township 33 North, Range 3 West, and leads to the creek drainage discussed in the vegetation section of this unit.

The Devil's Nest development that is adjacent to the project boundary was begun in the 1970s and intended to become a premiere residential and vacation complex before the development corporation went bankrupt. A small group of permanent and seasonal residents have since formed a landowners' association and have sought to maintain the area as a private entity with roads and facilities that are not open to the public.

Shoreline erosion is occurring within the unit at a steady pace but has not yet threatened any structures or boundary pins. The boat ramp jetty at Devil's Nest has riprap materials on it to protect against erosion from wave action.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.



### **6.2.33. EAST DEVIL'S NEST Management Unit**

MANAGEMENT UNIT NUMBER: 33 (OMP # 0032010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Bon Homme Colony, Knox County, Nebraska, Township 33 North, Range 3 West, Section 20. This unit is bordered on the west by Devil's Nest Creek and on the east by the section line between Sections 20 and 21.

SOILS INFORMATION: Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska (Schulte *et al.* 1997) for more specific soils information.

VEGETATION: This unit consists of steep bluffs and rugged terrain that has several deep drainages. Woody vegetation is restricted to the draws which contain an oak cedar tree community intermixed with various other woody shrubs. The ridges and open areas contain mostly native grasses and forbs. The western part of this unit, in the area of the Devil's Nest Creek drainage, contains some wetland plant species along the bottomland. Willow and cottonwood trees are found along the shoreline and other low areas while oak, cedar, ash, and woody shrubs occupy upland sites. The vegetation within this drainage is strikingly different and rich in plant and animal species as compared to the adjacent rangelands.

WILDLIFE: This unit supports a wide diversity of wildlife species. Whitetail deer and small game such as pheasant, quail, turkey, rabbit, furbearers, and non-game animal species seek food and cover in this unit which is bordered by rangeland. The Devil's Nest Creek area, located on the west end of the unit, encompasses a densely vegetated portion of land in which wildlife species tend to concentrate.

RECREATION: The lack of roads to this unit somewhat limits recreational use by the public. Knox County has declared an unimproved access road leading off the paved entrance road within the Devil's Nest development as a designated township road. This road is located in the

eastern half of Section 19, Township 33 North, Range 3 West, and leads to the Devil's Nest Creek drainage. Access by boat or across private property with landowner permission are the only other ways to reach this unit. The terrain is extremely rugged but willing individuals could walk or hike through the area. Hunting both upland game and whitetail deer are the primary recreational opportunities in the unit.

**PAST MANAGEMENT:** The area had been managed by the Nebraska Game and Parks Commission under a park and recreation lease until 1991 when the area was withdrawn from the lease. The unit is under the management of the Corps that in turn has entered into a grazing lease with a lessee. A rental abatement clause contained in the lease provides for maintenance by the lessee of a portion of open range that has been slowly encroached upon by eastern red cedar. The lessee physically removes the young trees by blading them off during the winter months. The rental abatement is located in this unit although the lease covers lands contained within both units 32 and 33.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.34. E. DEVIL'S NEST / MILLER CREEK Management Unit**

**MANAGEMENT UNIT NUMBER:** 34 (OMP # 0033010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad map Bon Homme Colony, Knox County, Nebraska, Township 33 North, Range 3 West, Sections 16 and 21. The unit is a very narrow strip of land bordered on the west by the split between Sections 20 and 21 and on the east by the Miller Creek Recreation Area.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

**VEGETATION:** This unit consists of rugged terrain with high vertical cut banks and several deep drainages. Woody vegetation is restricted to the draws which contain an oak cedar tree community intermixed with various other woody shrubs. The ridges and open areas contain mostly native mixed grasses and forbs.

**WILDLIFE:** This unit provides some benefit to wildlife by serving as a buffer zone between the lake and the upland range that is grazed by livestock. The mix of vegetation types and inaccessibility provides sheltered and mostly isolated habitat for small game and whitetail deer that utilize the resources of the area on a yearlong basis. The unit may serve as a corridor for wildlife to traverse the distance between other wildlife units and provides cover in the woody draws.

**RECREATION:** This unit is well suited for deer and upland game hunting. Use of the area however is relatively low due to the difficulty involved in accessing the area and very steep slopes. Some sightseeing and hiking does occur, mainly in the eastern portions of the unit due to its proximity to the Miller Creek Recreation Area.

**PAST MANAGEMENT:** This unit had been managed by the Nebraska Game and Parks Commission through a park and recreation lease until 1991. There are no specific development plans for the area other than to keep the area in its present condition and maintain the existing grazing lease in the unit. There has been extensive shoreline erosion within this unit but no loss of boundary pins or structures.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.35. MILLER CREEK Management Unit**

**MANAGEMENT UNIT NUMBER:** 35 (OMP # L034010200)

**LAND USE CLASSIFICATION:** Recreation

**LOCATION:** Management unit is located on USGS quad map Bon Homme Colony, Knox

County, Nebraska, Township 33 North, Range 3 West, Sections 15, 16, 21, and 22. This unit is the Miller Creek Recreation Area.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

**VEGETATION:** This unit contains vegetation types varying from native stands of cottonwood, oak, and cedar to maintained grass and tree species within the picnic and camping areas of the recreation area. Land located on the east side of the creek contains an intermediate to mature stand of trees growing along the shore. There is also mown turf landward of these trees that is maintained through shoreline use permits by the owners of adjacent cabin lots. On the west side of the creek is a large and dense stand of native trees growing on the northeast-facing slope within the unit and introduced grass species located along the ridge tops. The upper portion of the creek drainage within the unit is characterized by shallow water levels that support several wetland plant species such as cattail, bulrush, and reeds.

**WILDLIFE:** The predominant wildlife feature of this unit is a resident population of red-tailed hawks that nest in the area. Several furbearers such as beaver, mink, and muskrat inhabit the grounds bordering and including the creek drainage and turkey are common throughout the unit.

**RECREATION:** The unit that is accessible by county road R54C contains picnic sites, a small playground, primitive camping sites, vault toilets, potable water, gravel parking areas, and a boat ramp and dock. The picnic and camping areas, located on both sides of the creek, receive indiscriminate use by the public.

**PAST MANAGEMENT:** This unit is leased to the Nebraska Game and Parks Commission under a park and recreation lease. Management of the area has included maintenance of the gravel roads, boat ramp, and existing recreational facilities and upgrading them as repairs become more frequent or necessary due to visitor use. The mouth of the creek has been protected by a rock revetment and riprap lines the shore along both sides of the creek at this location. Littoral drift occurs here but because of deeper water at the mouth and sediment control structures up the creek, only periodic maintenance dredging is needed to keep the lake

access open for navigation. Some minor encroachments have occurred on the east side of the creek adjacent to cabin sites. They have typically involved household and personal property storage upon government lands and are resolved by the resource staff through contacting and informing the residents of the encroachment.

Cabin lots are located adjacent to this unit on both the east and west sides. Only those lots to the east have been developed at this time. Residents are both permanent and seasonal in nature and there are shoreline use permits for boat docks and associated facilities on the east side of the bay.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.36. MILLER CREEK TO BLOOMFIELD Management Unit**

MANAGEMENT UNIT NUMBER: 36 (OMP # L035010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Bon Homme Colony, Knox County, Nebraska, Township 33 North, Range 3 West, Section 15. This area is a small parcel of land located in the reach between Miller Creek and the Bloomfield Recreation Areas.

SOILS INFORMATION: Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

VEGETATION: This area is characterized by high vertical cut banks along the entire length of the unit. The upland area is covered with native woody vegetation. Oak and cedar trees are the primary species in this unit but mixed prairie grasses inhabit the few open ridges and portions containing poorer soil types.

**WILDLIFE:** This unit provides some benefit to wildlife by serving as a buffer zone between the lake and the upland range that is grazed by livestock. The vegetation and inaccessibility provides shelter and mostly isolated habitat for small game and whitetail deer that utilize the resources of the area on a yearlong basis.

**RECREATION:** This unit is used to some extent for deer and upland game hunting. Use of the area however is relatively low due to the difficulty involved in accessing the area and very steep slopes. The extreme eastern and western portions of the unit receive the most use due to their proximity to the recreation areas. Here, walk-in access is the only way to cross the unit that is narrow and contains no roads or trails.

**PAST MANAGEMENT:** This unit is managed by the Nebraska Game and Parks Commission. The area is suitable for wildlife habitat and no improvements or facilities have been (or are expected to be) developed within this unit due to the severe soil and slope conditions.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.37. BLOOMFIELD RECREATION AREA Management Unit**

**MANAGEMENT UNIT NUMBER:** 37 (OMP # L036010200)

**LAND USE CLASSIFICATION:** Recreation

**LOCATION:** Management unit is located on USGS quad map Bon Homme Colony, Knox County, Nebraska, Township 33 North, Range 3 West, Sections 14 and 15. This unit is the Bloomfield Recreation Area.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska (Schulte *et al.* 1997) for more specific soils information.

**VEGETATION:** The western portion of this unit contains several shelterbelt tree plantings surrounded by introduced cool-season grasses, chiefly brome grass, on nearly level ground along the shoreline of the lake. In the eastern portion of the unit, the terrain becomes gently rolling to steep in some locations and an intermittent drainage flows through the area. The dominant tree species in the drainages are oak, green ash, and eastern red cedar. Mixed shrub species comprise a secondary canopy and introduced grasses cover small clearings between drainages.

**WILDLIFE:** This area, although managed for recreation, is utilized by wildlife species such as songbirds, turkey, rabbit, pheasant, squirrel, raptors, and whitetail deer.

**RECREATION:** Visitation to this recreation area is relatively high due to its proximity to the towns of Crofton, Bloomfield, and to some degree, Norfolk, Nebraska. Designated camping sites are located within a mature shelterbelt in the unit although most visitors have preferred to set up camp along the shoreline and in clearings near the boat ramp. Potable water and a comfort station are available near the designated camping area but there is no electrical service to these sites. Six electrical pedestals that are designed to serve four camp units each were installed in 1991 in the areas adjacent to the boat ramp. Two such pedestals are located on either side of the ramp and four more are grouped in a grass field located to the southeast of the ramp adjacent to the playground equipment. A new chemical/water borne toilet facility was installed near the boat ramp parking area in 1991. There are picnic sites with tables and campfire grills along the lakeshore area adjacent to the designated camping area and a playground is located east of the boat ramp near a small camping loop. There is no developed swimming area, but many visitors utilize shallow water off the shoreline of the unit near the boat ramp for this purpose. The majority of use in this recreation area occurs during summer holiday weekends.

**PAST MANAGEMENT:** The unit is outgranted to the Nebraska Game and Parks Commission for park and recreation purposes. The open grass areas in the unit have been mown or hayed in an effort to increase the aesthetics of the area. Mowing of these areas has decreased or been delayed in the spring since 1991 when the Lake Office requested this action to provide for nesting of upland birds.

The recreation area is located along an exposed shoreline of the lake rather than in an embayment and erosion and siltation of the boat ramp is a continual problem. Launching and loading boats at this location can be difficult on anything but calm days because the ramp is subject to unchecked wave action. The shoreline along the water frontage has all been

stabilized with riprap but erosion continues to be a problem at each end of the unit where the slope has eroded around the bank protection. The riprap along 250 feet of the shoreline on the west end of this unit is in need of repair and a OMWR (# 86) was established in February of 1992 for this project. Protective fencing has been installed along some of the shoreline where picnic sites are located adjacent to vertical cut banks in an effort to reduce the possibility of injury to visitors. Day use activities and camping in this unit occur within the same locality as there is no clear distinction as to where the visitor can or cannot participate in these pursuits within the recreation area. The installation of electrical service near the boat ramp has actually encouraged this intermingling of visitor use. The development and upgrading of facilities has been dictated by visitor use rather than through overall unit site planning.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.38. BLOOMFIELD TO KOHLES ACRES Management Unit**

MANAGEMENT UNIT NUMBER: 38 (OMP # L037010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad maps Bon Homme Colony and Tabor SE, Knox County, Nebraska, Township 33 North, Range 3 West, Sections 13 and 14. This unit is bordered on the west by the Bloomfield Recreation Area and on the East by the frontage of the Kohles Acres residential development.

SOILS INFORMATION: Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County for more specific soils information.

VEGETATION: This area is characterized by high vertical cut banks along the entire length of the unit, most of which is covered with native woody vegetation. Oak and cedar trees are the primary species in this unit but mixed prairie grasses inhabit the few open ridges and clearings within the unit.



**WILDLIFE:** This unit provides some benefit to wildlife by serving as a buffer zone between the lake and the upland range that is grazed by livestock. The steep, wooded draws and inaccessibility provides shelter and habitat for small game and whitetail deer that utilize the resources of the area on a yearlong basis.

**RECREATION:** This unit is used to some extent for deer and upland game hunting. Use of the area however is relatively low due to the difficulty involved in accessing the area and very steep slopes. The extreme eastern and western portions of the unit receive the most use due to their proximity to the recreation area and residential development.

**PAST MANAGEMENT:** This unit is managed by the Nebraska Game and Parks Commission. The area is suitable for wildlife habitat and no improvements or facilities have been or are expected to be developed within this unit due to the severe soils and slope conditions that limit management practices within the unit. Shoreline erosion in this unit has been extensive but to date has not threatened any structures or government boundary pins.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.39. KOHLES ACRES FRONTAGE Management Unit**

**MANAGEMENT UNIT NUMBER:** 39 (OMP # 0038010501)

**LAND USE CLASSIFICATION:** Multiple Resource – Recreation Low Density

**LOCATION:** Management unit is located on USGS quad map Tabor SE, Knox County, Nebraska, Township 33 North, Range 3 West, Section 13. This unit is a thin parcel of land along the frontage of the Kohles Acres residential development.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

**VEGETATION:** Much of the land in this unit is comprised of open, introduced grassland vegetation, some of which is mown by adjacent landowners through the Shoreline Use Permit Program. There are some clumps of native cottonwood and ash trees that tend to grow in low spots and along drainages. Native cedar trees are found widely scattered throughout the unit.

**WILDLIFE:** This area, although managed for recreation and located near dwellings, is still utilized by wildlife species such as songbirds, turkey, rabbit, squirrel, raptors, and whitetail deer.

**RECREATION:** Primary recreational use of this unit is made by residents of Kohles Acres and their guests taking part in water-related sports. Several of the homeowners maintain fishing piers and boat docks along the shoreline of the unit. The thin strip of Corps-managed land that exists in this area, combined with the close proximity of homes to the project boundary, does not make this unit an attractive location for recreation outside of the immediate community.

**PAST MANAGEMENT:** The unit had been managed by the Nebraska Game and Parks Commission but was not desired by them for recreational development and management. Management was relinquished back to the Corps of Engineers in 1992. Shoreline erosion within the unit has been extensive with some areas of the bank retreating hundreds of feet landward, reducing some project lands to areas of only 50 to 75 feet in width. Critical areas have received bank stabilization and riprap work by the Corps to protect structures and prevent encroachment of the lake onto private property of adjacent landowners.

Many of the fishing piers and docks in this area have been poorly built and are poorly maintained, resulting in safety concerns and deficiencies with regard to Shoreline Use Permit conditions. Unstable bank conditions and exposure to erosive wind and water elements are some of the factors that render maintenance of any structure difficult in this stretch of the lake.

Several encroachments involving private property storage on Government lands have occurred within this unit but the area is inspected periodically and the encroachments resolved by the Lewis and Clark Natural Resources staff. The Kohles Acres Sanitary Improvement District operates a sewage treatment facility located on the extreme eastern edge of the unit. There have been water quality problems associated with elevated fecal coliform levels at beaches

downstream of this unit. An off-project sewage lagoon was designed and constructed to resolve this problem.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.40. WEIGAND, BURBACH RECREATION AREAS Management Unit**

MANAGEMENT UNIT NUMBER: 40 (OMP #L039010200)

LAND USE CLASSIFICATION: Recreation

LOCATION: Management unit is located on USGS quad map Tabor SE, Knox County, Nebraska, Township 33 North, Range 2 West, Sections 17 and 18. This unit is comprised of the Weigand and Burbach Recreation Areas.

SOILS INFORMATION: Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Aowa Shell Kezan soils can be found along the Weigand Creek drainage in this unit. These soils are deep and level silty loams that are typically rich and well suited to vegetative plantings if adequately drained. Refer to the Soil Survey of Knox County for more specific soils information.

VEGETATION: The topography of this unit is nearly level and vegetation consists predominantly of brome grass and mixed native grasses. There are several large blocks of shelterbelt trees and shrubs that are utilized to provide shade and protection for campsite and picnic spaces. There is a stand of native cottonwood trees that is located along the shoreline of the Burbach area in a band approximately 150 to 200 feet wide. Cool-season grasses in both of the recreation areas are mown within picnic, camping, and playfield areas. Outlying areas between shelterbelts and undeveloped sites within the unit are also mown and/or hayed at the direction of the Nebraska Game and Parks Commission. A small population of wetland plant species can be found within the Weigand Creek drainage.

**WILDLIFE:** Whitetail deer, upland game birds, and non-game wildlife species make use of the less developed regions within this unit. The mature shelterbelts serve as winter cover and many of the woody plant species provide a food source for wildlife.

**RECREATION:** The Burbach Recreation Area is accessed off of county road R54C and the various facilities are connected by gravel-surfaced roads. Facilities available include non-electric campsites, picnic sites, comfort stations, a beach, change house, and potable water. The area is utilized by visitors seeking a quiet and more secluded or primitive site to picnic and camp. The area also serves as an overflow area for the more popular Weigand Recreation Area on summer holiday weekends. The beach area on the west side of the unit was one of the most popular features of the Burbach area but maintaining an adequate supply of sand is hampered by littoral drift and an inadequate natural supply of sandy soil at this location. There have been water quality problems associated with elevated fecal coliform levels in this area of the lake.

The Weigand Recreation Area covers the eastern portion of this unit and is accessed off of county road R54C via two asphalt-surfaced roads. The Weigand area is the most heavily used recreation area on the Nebraska side of Lewis and Clark Lake. Visitors are attracted to the recreation area which features a two-lane boat ramp, boat slips, picnic area, picnic shelters, electric and non-electric campsites, fish cleaning table, a beach, playground, comfort stations, public phone, and potable water.

**PAST MANAGEMENT:** Burbach Recreation Area is managed by the Nebraska Game and Parks Commission through a parks and recreation lease. One section of the shoreline in the vicinity of the beach received riprap to slow the bank erosion occurring at this location. The beach area itself is buoyed during the summer and receives moderate use in the summer months. During periods of low pool elevation, medium and large moss covered rocks cover the lakebed at this location that are slippery to walk on and detract from the use of the beach for swimming.

The Weigand Recreation Area is leased to the Nebraska Game and Parks Commission but the marina itself has been operated and maintained by a concessionaire. Marina facilities in the Weigand area consisted of a combination convenience store/grill and gas station, boat slip rental, marine gas pump, boat/camper storage yard, and rental trailers.

Past management of the marina through a concession agreement was not up to standards the public expects to find in a main recreation area on a lake such as Lewis and Clark. Several factors led to a decline in the quality and quantity of service to the public and of the marina facilities. The wooden docks in the marina bay were in a serious state of disrepair and repeated notification was given to the NGPC regarding the safety hazard that the docks posed to the visiting public. Intervention by the Corps in regards to the latter issue was taken in 1993 by directly shutting down portions of the docks and working with the state to review management of the recreation area. Inadequate supervision and planning in the unit has led to camping in picnic areas, playgrounds, and haphazardly along the shoreline. Ineffective and poor signing within the area contributes to the indiscriminate use of the facilities and degradation of the resources of the area by visitors. The beach area here is similar in condition and has the same associated problems as the one in the Burbach area. The hard point where the swim beach is located and the entire marina basin have received riprap materials as well as the shoreline from the marina bay eastward to the unit boundary.

In 1994, extensive renovation of the Weigand area began through the actions of the Nebraska Game and Parks Commission in Phase I of the renovation plans for the recreation area. The concession agreement was not renewed and the operation of the area went back directly to the state. Work performed included the removal of the old docks, a new dock configuration and layout with 80 slips, relocation of the gas and service dock, the installation of sidewalks around the marina bay and a retaining wall, removal of the concessionaire building and underground fuel storage tanks, and the removal of private trailers that had in the past been used as cabins. A new camping loop was established to help define and separate use in what was once just an open field. Future development during Phase II will include a new marina building, restrooms, and parking area.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.41. WEIGAND TO WALKER'S VALLEY Management Unit**

MANAGEMENT UNIT NUMBER: 41 (OMP # L040010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad map Tabor SE, Knox County, Nebraska, Township 33 North, Range 2 West, Sections 16 and 17. This unit is a thin parcel of land approximately 1.5 miles in length bounded on the west by the Weigand Recreation Area and on the east by the Walker's Valley View residential development.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

**VEGETATION:** This unit contains steeply sloping topography dominated by dense native stands of cedar and oak trees in and around three major drainages running through the reach. This area is characterized by vertical cut banks along the entire length of the unit varying in height from 30 to 100 feet.

**WILDLIFE:** This unit provides some benefit to wildlife by serving as a buffer zone between the lake and the upland range that is grazed by livestock. The steep, wooded draws and inaccessibility provides shelter and habitat for small game and whitetail deer that utilize the resources of the area on a yearlong basis.

**RECREATION:** The area is accessible by foot from either end of the unit but soils are too steep for roads in this stretch of the lake. Some hunting may be made of this unit although there is no data to show such activity. Hiking, sightseeing, and shoreline fishing takes place at the extreme east and west ends of the unit.

**PAST MANAGEMENT:** The unit is managed by the Nebraska Game and Parks Commission for fish and wildlife purposes through a license from the Corps. The area is suitable for wildlife habitat and no improvements or facilities have been (or are expected to be) developed within this unit due to the severe soils and slope conditions, which limit management practices within the unit. Shoreline erosion within this unit has been extensive and has led to the loss of one government boundary pin.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

## **6.2.42. WALKER'S VALLEY FRONTAGE Management Unit**

MANAGEMENT UNIT NUMBER: 42 (OMP # 0041010501)

LAND USE CLASSIFICATION: Multiple Resource – Recreation Low Density

LOCATION: Management unit is located on USGS quad map Tabor SE, Knox County, Nebraska, Township 33 North, Range 2 West, Sections 15 and 16. This unit includes the reach along the frontage of the Walker's Valley View residential development eastward to the Deep Water Recreation Area.

SOILS INFORMATION: Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

VEGETATION: The western portions of the unit contains oak cedar tree stands intermixed with native and introduced grass species. Some of these areas are maintained by adjacent lot owners under Shoreline Use Permits for vegetative modification. On the eastern portions of the unit the topography becomes more rugged and is densely vegetated with an oak/cedar tree association.

WILDLIFE: This unit provides some benefit to wildlife as a corridor for wildlife to traverse the shoreline of the reservoir and it serves as a buffer zone between the lake and the adjacent homes in the western portion of the unit. The steep, wooded draws throughout the eastern portion of the unit provide shelter and habitat for small game and whitetail deer that utilize the resources of the area on a yearlong basis.

RECREATION: The local housing association maintains a privately built boat ramp and dock that is accessed by gravel roads leading through the development from County Road R54C. The ramp is available for use by the public but the majority of use comes from local residents for launching both fishing and pleasure craft. There are several mooring buoys located adjacent to the ramp, some of which are for seasonal boat mooring to Shoreline Use permittees and others for temporary day use mooring on a first come, first serve basis.

The boat ramp is located along an intermittent drainage that runs through the area. The small drainage floodplain consists of nearly level sandy soil. A sand volleyball court is located in this area and is approved by a conditional letter of permission from the Lake Manager. Sunbathing and some swimming and wading activities are also pursued in the vicinity of the shoreline in this unit and no problems with boat traffic have been noted in the past.

**PAST MANAGEMENT:** The unit had been managed by the Nebraska Game and Parks Commission but this tract of land was no longer desired by the Commission for recreational development and management was relinquished back to the Corps of Engineers in 1992. Shoreline erosion within the unit has been extensive with some areas of the bank retreating hundreds of feet landward, reducing the amount of managed lands significantly. One small tract of land in Section 16 that contained two project boundary corners has been lost entirely due to erosion.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.43. DEEP WATER RECREATION AREA Management Unit**

**MANAGEMENT UNIT NUMBER:** 43 (OMP # L042010501)

**LAND USE CLASSIFICATION:** Multiple Resource – Recreation Low Density

**LOCATION:** Management unit is located on USGS quad map Tabor SE, Knox County, Nebraska, Township 33 North, Range 2 West, Section 15. This unit is referred to as the Deep Water Area and contains land within the eastern half of Section 15.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

**VEGETATION:** This unit contains steeply sloping topography almost completely covered by a dense canopy of cedar and oak trees within the reach. There are vertical cut banks along the



shoreline that vary in height from 30 to 100 feet with the exception of a small bay located on the western end of the unit. There are a few small clearings of mixed grasses along the access road leading down into the area and following the top of a pronounced ridge in the unit.

**WILDLIFE:** This unit provides wildlife with a corridor to traverse the shoreline of the reservoir and it serves as a buffer zone between the lake and the adjacent homes bordering the project boundary. The steep, wooded draws in the unit provide habitat and food sources for small game and whitetail deer that utilize the resources of the area on a yearlong basis. A small marsh area that is located at the mouth of the major drainage area in the unit supports furbearers and provides a staging area for some waterfowl species.

**RECREATION:** This unit offers visitors access to the lakeshore for limited recreational activities within the area. Facilities include a vault toilet and fire grills located at four available picnic/camping sites. Shore fishing can be done in the immediate area of the road access where the former boat ramp was located. Sightseeing, hiking, and nature study are the other possible recreation activities in this unit.

**PAST MANAGEMENT:** The unit is leased to the Nebraska Game and Parks Commission through a park and recreation lease. A boat ramp formerly available in this area has been abandoned because of the difficulty involved in keeping it, and the small bay it was located in, clear of sediment from littoral drift along the shoreline. The Nebraska Game and Parks Commission has worked hard to maintain the steep access road into the area with mixed results. The road is usable during dry weather periods but a sign posted near the top of the road where it joins County Road R54C warns visitors of use during wet weather.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.44. MISCHE FRONTAGE Management Unit**

**MANAGEMENT UNIT NUMBER:** 44 (OMP # 0043010501)

**LAND USE CLASSIFICATION:** Multiple Resource – Recreation Low Density

**LOCATION:** Management unit is located on USGS quad map Tabor SE, Knox County, Nebraska, Township 33 North, Range 2 West, Section 14. This unit is the frontage area of the Mische residential development.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

**VEGETATION:** This unit contains steeply sloping topography dominated by dense native stands of cedar and oak trees in and around two intermittent drainages running through the 1/2-mile reach. This area is characterized by vertical cut banks along much of its length that vary in height from 50 to 100 feet.

**WILDLIFE:** This unit provides some benefit to wildlife as a corridor for wildlife to traverse the shoreline of the reservoir and it serves as a buffer zone between the lake and the homes located adjacent to the unit. The woody draws throughout the unit provide shelter and habitat for small game and whitetail deer that utilize the resources of the area on a yearlong basis.

**RECREATION:** The area is accessible by foot from either end of the unit, along the shoreline and from the Mische development but soils are too steep for roads in this stretch of the lake. Hiking, sightseeing, and shoreline fishing are possible recreational activities in the unit.

**PAST MANAGEMENT:** The Nebraska Game and Parks Commission had managed the unit but this tract of land within the park and recreation lease was not desired for recreational development and management was relinquished back to the Corps of Engineers in 1992.

**REAL ESTATE OUTGRANTS:** There are no outgrants in this unit.

#### **6.2.45. HIDEAWAY ACRES FRONTAGE Management Unit**

**MANAGEMENT UNIT NUMBER:** 45 (OMP # L044010501)

**LAND USE CLASSIFICATION:** Multiple Resource – Recreation Low Density

**LOCATION:** Management unit is located on USGS quad map Tabor SE, Knox County, Nebraska, Township 33 North, Range 2 West, Section 14. This unit is the frontage area of the Hideaway Acres residential development.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

**VEGETATION:** This unit contains steeply sloping topography almost completely covered by a dense canopy of cedar and oak trees within the reach. There are vertical cut banks along the shoreline that vary in height from 30 to 100 feet with the exception of a small bay located on the eastern edge of the unit. There are a few small clearings of mixed grasses along the access road leading down into the area and in the vicinity of the marina bay. There are a few wetland plants that can be found along the edges of the drainage leading away from the bay.

**WILDLIFE:** This unit provides wildlife with a corridor to traverse the shoreline of the reservoir and it serves as a buffer zone between the lake and the adjacent homes bordering the project boundary. The steep, wooded terrain in the unit provides habitat and food sources for small game and whitetail deer that utilize the resources of the area on a yearlong basis.

**RECREATION:** The primary recreational activities in this unit revolve around use of the marina. The bay area contains a boat ramp, courtesy dock, and small parking lot. The ramp is open for public use but is used mainly by local residents due to the steepness of the entrance road and a limited parking area. There are boat slips in the small bay that are occupied during the summer recreation season by watercraft owned by adjacent seasonal and resident homeowners.

**PAST MANAGEMENT:** This unit was managed by the Nebraska Game and Parks Commission by a park and recreation lease until 1992. The concessionaire who managed the Weigand marina was also responsible for marina operations in this unit. The docks and walkways around the boat slips were not maintained in good repair at all times. The decking and floatation in particular experienced many of the same problems discussed in Unit 39 for

the Weigand marina. In 1993, management of the area was turned back to the Corps and a real estate instrument was granted to the Hideaway Acres Homeowners Association for management of the area. Association members paid for dredging of the bay and installation of new docks. Members own outright each particular portion of boat slip they occupy and can then sell their interest in that portion at any time. A marina committee collects dues from slip owners and performs maintenance on common areas of the docks and surrounding areas. The boat ramp, a courtesy boat slip, and adjacent marina area remain open to public use.

The marina bay was constructed by the developer of the adjacent Hideaway Acres residential area. A sediment control structure was installed off project lands at the time of construction and helps reduce siltation into the bay. The mouth of the bay is subject to littoral drift and requires periodic maintenance to keep it open for navigation. Dredged materials and other fill make up a small breakwater/revetment to the west of the mouth of the bay. The bank of this structure has been covered with riprap to provide shoreline stabilization. The entrance roads around Hideaway Acres including the one to the boat ramp are designated township roads.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.46. SOUTH SHORE WILDLIFE AREA Management Unit**

**MANAGEMENT UNIT NUMBER:** 46 (OMP # L045010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Recreation Low Density

**LOCATION:** Management unit consists of 90 acres and is located on USGS quad maps Gavins Point Dam, Knox County, Nebraska, Township 33 North, Range 2 West, NE ¼ of Section 13. This unit is bordered on the west by Hideaway marina and on the east by the South Shore Recreation Area.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

**VEGETATION:** This unit contains steeply sloping topography dominated by dense native stands of cedar and oak trees with intermittent drainages running through the unit's reach.

**WILDLIFE:** The habitat found in this unit supports wildlife game species such as whitetail deer, turkey, quail, squirrel, and rabbit. Future development of adjacent private lands for residential housing adjacent to this unit will make the remaining project lands valuable for wildlife because of the unit's relatively large land base and its capacity to support many species within its boundary. The western portions of the unit will be of a special significance with regard to serving as a buffer zone between the residential and the wildlife uses of the area.

**RECREATION:** Sightseeing, hiking, and nature study are some of the possible recreation activities to pursue within this unit. Access to the unit is off Nebraska Highway 121.

**PAST MANAGEMENT:** This unit has been managed by the Nebraska Game and Parks Commission as part of the Hideaway to South Shore Unit.

**REAL ESTATE OUTGRANTS:** No outgrants at this area.

#### **6.2.47. HIDEAWAY TO SOUTH SHORE REC. Management Unit**

**MANAGEMENT UNIT NUMBER:** 47 (OMP # L045010502)

**LAND USE CLASSIFICATION:** Multiple Resource – Wildlife Management

**LOCATION:** Management unit is located on USGS quad maps Tabor SE and Gavins Point Dam, Knox County, Nebraska, Township 33 North, Range 2 West, Sections 12, 13, and 14. This unit is bordered on the west by Hideaway marina and on the east by the South Shore Recreation Area. The unit also includes a sizable parcel of land to the south of Nebraska

Highway 121.

**SOILS INFORMATION:** Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

**VEGETATION:** This unit contains steeply sloping topography dominated by dense native stands of cedar and oak trees with intermittent drainages running through the unit's reach. The shoreline is characterized by vertical cut banks along much of its length that vary in height from 50 to 100 feet. The eastern portions of the unit contain some large clearings of native grasses located primarily on the hilltops and ridges above the high bluffs overlooking the lake. Highway right-of-ways and a high voltage power line right-of-way in the unit contain introduced and native grass species which are maintained by the permittee for their authorized purposes. A small bay located approximately in the center of the unit's reach has been cut off by littoral drift and contains some wetland plant species as the result of ponding during periods of wet weather and an intermittent drainage which feeds into the bay.

**WILDLIFE:** The habitat found in this unit supports wildlife game species such as whitetail deer, turkey, quail, squirrel, and rabbit. Future development of adjacent private lands for residential housing adjacent to this unit will make the remaining project lands valuable for wildlife because of the unit's relatively large land base and its capacity to support many species within its boundary. The western portions of the unit will be of a special significance with regard to serving as a buffer zone between the residential and the wildlife uses of the area.

**RECREATION:** Sightseeing, hiking, and nature study are some of the possible recreation activities to pursue within this unit. Access to the unit is limited both by topography and the lack of public roads leading to the project take line. Hunters willing to walk into the area from either side of Nebraska Highway 121 can find populations of whitetail deer and turkey.

**PAST MANAGEMENT:** The Nebraska Game and Parks Commission manages this unit. Shoreline erosion within the unit has been extensive in the western parcels with some areas of the bank retreating landward, reducing the amount of managed lands to thin ribbons 20 to 50 feet in width. There are annual expenditures for fence and sign maintenance as well as the control of noxious weeds throughout the wildlife management area. The state has an ongoing program to establish and maintain woodland clearings in the unit using various cultural

practices including fire as management tools. State personnel provide supervision duties within the unit.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.48. SOUTH SHORE RECREATION AREA Management Unit**

MANAGEMENT UNIT NUMBER: 48 (OMP # L047010501)

LAND USE CLASSIFICATION: Multiple Resource – Recreation Low Density

LOCATION: Management unit is located on USGS quad map Gavins Point Dam, Knox County, Nebraska, Township 33 North, Range 2 West, Sections 12 and 13. This unit is the South Shore Recreation Area.

SOILS INFORMATION: Soils are of the Labu Lynch Sansarc association. These are moderately deep to shallow soils with steep and severe slopes, found on well-drained uplands. Refer to the Soil Survey of Knox County, Nebraska for more specific soils information.

VEGETATION: Oak, ash, and cedar species are the dominant trees found within the three major drainages in this unit. A large drainage area that feeds into a shallow bay where the boat ramp is located contains some emergent vegetation. Here cattail, reeds, and sedges can be found where sediment inflows down the creek have been deposited further inland of the lake forming shallow water. Introduced grass species such as brome grass are found in association with roadsides and the open sites within the camping and picnic areas.

WILDLIFE: The steep, wooded draws in the unit provide habitat and food sources for small game and whitetail deer that utilize the resources of the area on a yearlong basis. A small marsh area that is located at the mouth of the major drainage area in the unit supports intermittent use by furbearers and some waterfowl species.

**RECREATION:** This unit serves primarily as a lake access point containing a boat ramp, picnic and primitive camping area, vault toilet, and the western trailhead for the Calumet Bluff hiking trail which continues eastward to an overlook parking area located in management unit number 47. No potable water exists within the recreation area. The boat ramp in this area is popular during the summer months when winds are from the south because it offers an area to launch craft that is protected from wind and wave action. Shore fishing is a popular activity in this unit both along the picnic area and across the bay on a small beach area formed from dredged and littoral drift materials at the mouth of the bay.

**PAST MANAGEMENT:** This recreation area has become smaller in size in terms of easily accessible facilities contained within its land base. In the past, the entrance road split in three directions upon entering the recreation area shortly after turning off of Highway 121. One road continued northwest to the boat ramp, a second road led north to a picnic and playground area, and a third road led to the northeast to a scenic overlook and turnaround area. This third road was obliterated and seeded to grass when the adjacent Crofton Lakeview golf course was constructed in the late 1980s. Some lands within the South Shore Recreation Area in the area of the overlook and turnaround area became part of the lease for the golf course. The second road mentioned previously was reduced in length and barricaded by the Nebraska Game and Parks Commission just past a parking area near its mid-point. This action was done in an effort to reduce problems associated with vandalism and late night parties that occurred in the picnic area and were not being curtailed through patrols of the area. Presently, this vicinity of the unit receives little use because the road dead ends and facilities in the former picnic area are no longer maintained. Old grills and vault toilets remain in the area that is still accessible by foot from adjacent areas of the unit. The mouth of the bay leading to the boat ramp has received riprap materials to guard against any shoreline erosion due to wave action and the entrance to the bay needs periodic dredging to retain lake access.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.49. CROFTON GOLF COURSE Management Unit**

**MANAGEMENT UNIT NUMBER:** 49 (OMP # L048010200)

**LAND USE CLASSIFICATION:** Recreation



**LOCATION:** Management unit is located on USGS quad map Gavins Point Dam, Knox County, Nebraska, Township 33 North, Range 2 West, Sections 12 and 13 and Township 33 North, Range 1 West, Sections 7 and 18 of Cedar County, Nebraska. This unit is the Crofton Lakeview Golf Course that lies west of Nebraska Highway 121, south of the Nebraska overlook road and is bordered on the west by the South Shore Recreation Area.

**SOILS INFORMATION:** Soils are of the Loretto Thurman Ortello associations, which are well suited for windbreaks and recreational tree plantings but have low available water capacity. The soils are rated fair to moderate for road and building construction and good for use and content of construction materials. Care should be exercised in the development of sanitary facilities due to the soil's limited ability to filter effluent. For more information refer to the Soil Survey of Cedar County, Nebraska.

**VEGETATION:** The vegetation within this unit is divided between turf grass species on the golf course fairways and dense trees and shrubs that are found along either side of a wide drainage which transects the unit. The predominant tree species in the unit belong to the cedar oak association that is complemented by a variety of forbs and shrub species such as buck brush, wild rose, plum, and sumac.

**WILDLIFE:** The steep, wooded draws in the unit provide habitat and food sources for small game and whitetail deer that utilize the resources of the area on a yearlong basis. Songbirds and other non-game animal species also utilize the unit.

**RECREATION:** The nine hole golf course features irrigated fairways, a cart storage building, a clubhouse, and a "pro shop" providing club and cart rentals. A small bar in the clubhouse serves beer, pop, and snack items. The eastern trailhead of the Calumet Bluff hiking trail is located within the unit and originates in a small overlook parking lot reached by continuing along an access road west of the golf course entrance. The trail continues west for 9/10ths of a mile where it terminates at the South Shore Recreation Area.

**PAST MANAGEMENT:** The unit was managed for wildlife purposes prior to the construction of the golf course in 1989. The golf course was constructed to meet public demand for such a facility in this area of the lake. The course is maintained and operated by the City of Crofton under lease from the Corps of Engineers. The Corps communication tower is located west of the golf course on a hilltop that is not included in the lease area. Portions of the shoreline have

received riprap to protect against shoreline erosion and the loss of any project structures and features.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.50. MAINTENANCE SHOP Management Unit**

MANAGEMENT UNIT NUMBER: 50 (OMP # 0049010100)

LAND USE CLASSIFICATION: Operations

LOCATION: This unit is located on USGS quad map Gavins Point Dam, Cedar County, Nebraska, Township 33 North, Range 1 West, Sections 7 and 18. This unit is located east and south of Nebraska Highway 121 and is bounded on the east by the land within Section 7.

SOILS INFORMATION: Soils are of the Loretto Thurman Ortello association that is well suited for windbreaks and recreational tree plantings but have low available water capacity. The soils are rated fair to moderate for road and building construction and good for use and content of construction materials. Care should be exercised in the development of sanitary facilities due to the soil's limited ability to filter effluent. For more information refer to the Soil Survey of Cedar County Nebraska.

VEGETATION: This unit contains three distinct vegetation representations that are found in differing parts of the area. The area of the unit lying northwest of the Corps maintenance facility is comprised of brome grass and some native grasses interspersed between shelterbelt plantings of lilac, honeysuckle, ash, elm, honey locust, and cedar. The eastern area of the unit has steep slopes and contains wooded draws that are densely covered with oak, ash, and cedar tree species as well as other woody shrubs. The remaining portion of the unit is covered with mixed native grasses and other grass, predominantly smooth brome, which has spread over previously disturbed land. This type of vegetation is also applicable to the grounds immediately adjacent to the maintenance facility and the highway right-of-ways.

**WILDLIFE:** The habitat found in this unit supports wildlife game species such as whitetail deer, turkey, quail, squirrel, and rabbit. The unit has a relatively large land base and capacity to support many species within its boundary. The eastern portions of the unit containing the woody draws are of a special significance with regard to serving as a buffer zone between the adjacent residential development and the maintenance uses of the unit.

**RECREATION:** This area is not managed for recreation but some limited opportunities do exist within the unit. The portions of land located south and east of the maintenance shop compound are open to hunting and are used to a small degree for this purpose. The other recreational opportunities in this area include sightseeing, hiking, bird watching, and nature study.

**PAST MANAGEMENT:** The primary focus of this unit is the maintenance compound which has three large storage buildings and a heated shop/garage that also accommodates offices and facilities for outside maintenance personnel. Several pieces of heavy equipment, vehicles, materials, and supplies are stored both in the buildings and around the open yard within the fenced compound. Land adjacent to the yard is used for stockpiling sand, gravel, rock, and soil for various maintenance and recreation use. This same area is also the location of a dump/landfill used by the project in past years and which may be the focus of future efforts to clean up the site. There is a two-cell sewage treatment pond in this unit which services waste from all of the Corps of Engineers facilities located in Nebraska. Several construction activities took place in the maintenance base facility during 1991. A new storage building located in the compound was constructed during 1991. The shop and garage building received new outside insulation and siding, overhead doors, weather stripping, and caulking to refurbish the exterior of the masonry block building. A pole barn was built outside the compound in 1994 by project and inmate personnel for additional storage of equipment and materials.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.51. OVERLOOK AND TAILWATERS Management Unit**

**MANAGEMENT UNIT NUMBER:** 51 (OMP # 0050010200)

## LAND USE CLASSIFICATION: Recreation

**LOCATION:** Management unit is located on USGS quad map Gavins Point Dam, Cedar County, Nebraska, Township 33 North, Range 1 West, Sections 7 and 8. This unit covers land containing the Overlook area, Visitor Center, Lake Offices, Tailwaters Recreation Area and a strip of land adjacent to the right bank of a downstream river gauging station.

**SOILS INFORMATION:** This unit encompasses a broad range of topography from river bottoms in the Tailwaters area to upland sites on elevated bluffs near the overlook and visitor center. The low areas contain soils of the Sarpy Blake Albion association that are sandy, silty clay soils formed in alluvial deposits of the former floodplain. Special construction techniques are needed to elevate structures, compact soil, or provide for drainage around buildings and structures located on these soils. They are well suited for wildlife plantings and in general have moderate permeability. Soils in the higher elevations in the unit are of the Redstone Gavins association. These are moderately deep soils with very limited water holding capacity and are vulnerable to both wind and water erosion. Refer to the Soil Survey of Cedar County, Nebraska for more specific soils information.

**VEGETATION:** The western portions of this unit are comprised of upland habitat with oak cedar species dominating the drainage areas and introduced grasses making up the ridges and clearings. There is an irrigated lawn area at the visitor center and around the administration office building. Turf is maintained in the recreation areas and along roadways in the unit. The bottomland is comprised primarily of cottonwood and ash trees accompanied by several woody shrub species. The lands within the Tailwaters Recreation Area contain cultivated turfgrasses and several ornamental tree and shrub plantings.

**WILDLIFE:** The habitat found in this unit supports wildlife game species such as whitetail deer, turkey, quail, squirrel, and rabbit. The unit has a relatively large land base but its capacity to support wildlife species is limited by their tolerance for human disturbance in the area. Late fall, winter, and early spring use of the unit can occur with limited intrusion from park visitors. Bald eagles congregate in this unit during the months of December, January, and February of each year and utilize mature cottonwood tree perches and open water downstream of the dam for winter habitat. Favorite perch trees are located along a high north-facing bluff between the Tailwaters Recreation Area and the downstream limit of the powerhouse tailrace structure. Visitors are attracted to this locality to watch bald eagles and a good vantage point is available from the visitor center. An endangered pallid sturgeon was accidentally hooked by a

fisherman in the tailrace during the 1980s and the fish was recovered by a state conservation officer and transported to the Gavins Point fish hatchery.

**RECREATION:** The Visitor Center located within this unit is one of nine such Corps regional visitor centers in the nation. On average, 25,000 to 30,000 people visit this facility each year. Special interpretive programs are given to school children and other groups year round. Adjacent to the Visitor Center is a large picnic shelter that can be reserved for use by large groups during the summer recreation season. There is also a playground, drinking water, and comfort station facilities available adjacent to the shelter.

A group tent camping area and two additional roadside picnic areas are located east of the Visitor Center along Nebraska Highway 121 and project roads leading from the dam. These areas receive intermittent use and the camping area contains a vault toilet that is available year-round.

The Nebraska Tailwaters Recreation Area is located within this unit. The area contains both a fee campground and day use facilities. The campground features a comfort station, potable water, electrical service, surfaced camp pads, and a vault toilet. There are 34 campsites having electrical service and 9 non-electric campsites in this area. Camping fees are collected by a contract gate attendant during the summer fee season and they also provide surveillance of the area and provide information to visitors. The day use area of Nebraska Tailwaters contains a boat ramp and dock, picnic sites, vault toilets, a handicap fishing pier, and public phone. Supporting facilities for this area are a sanitary dump station and fish cleaning facility that are located on the bluffs above the camping area along Nebraska Highway 121.

**PAST MANAGEMENT:** The Visitor Center contains exhibits and displays on natural history, dam construction, and past activities in the Yankton area. New Visitor Center exhibits were installed in 1998. An audiovisual room and small auditorium is used to present interpretive programs and for holding meetings throughout the year. The offices of the Lewis and Clark Natural Resources staff had been located within the building until being relocated to the new administration building when construction was completed in 1992.

The Tailwaters Recreation Area is a popular spot for year-round recreational activities. The configuration of the camping sites in this unit is unique because there are 9 non-electric sites located along the access road before reaching the fee booth and boat ramp.

These sites were developed to function as an overflow area during peak demand for camping. They are little more than parking spaces along the asphalt drive in the recreation area. The result is that there is fee camping and free day use activities utilizing the same space within the recreation area. The boat ramp is used during both the summer and winter months because flows from the power plant ensure that it doesn't freeze over with ice. Bank fishing and use of the handicap fishing pier are other attractions within the unit. The camping area in this unit is popular with fishermen because of the easy access to a boat ramp for downstream fishing.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.52. DAM, POWER PLANT, AND BOAT YARD Management Unit**

MANAGEMENT UNIT NUMBER: 52 (OMP # 0051010100)

LAND USE CLASSIFICATION: Operations

LOCATION: Management unit is located on USGS quad map Gavins Point Dam, Cedar County, Nebraska, Township 33 North, Range 1 West, Section 7 and in Yankton County, South Dakota, Township 93 North, Range 56 West, Sections 17 and 20. This unit includes the dam embankment, power plant, boat yard, and a triangular parcel of land in Yankton County, South Dakota north of Highway 52.

SOILS INFORMATION: The soils in Cedar County, Nebraska are of the Crofton Alcester association. These soils are located on steep foot slopes and uplands and are well drained silty soils that are formed in loess and chalk/clay substrates. In Yankton County, South Dakota, the soils are of the Forney Haynie Sarpy association and consist of deep and level, moderately drained, silty and sandy floodplain soils. Refer to the Soil Survey of Yankton County and the Soil Survey of Cedar County for more specific soils information.

VEGETATION: The vegetation in this unit is limited to the dam embankment and a parcel of land north of SD Highway 52. In each of these locations, cool-season brome is the dominant

grass species with an intermingling of other cool- and warm-season grasses.

**WILDLIFE:** The vegetation and location of this unit is not favorable for wildlife habitat. Small rodents such as mice, voles, and ground squirrels are present but not in great numbers. Golden eagles, owls, and other raptors do pass though the unit and in some degree prey upon the rodents previously mentioned.

**RECREATION:** The powerhouse is open to the public for guided daily tours during the summer recreation season. Exhibits and displays are located in the powerhouse lobby and describe the functions of Gavins Point Dam as well as the entire main stem reservoir system. Three parking areas located along the crest of the dam offer scenic vistas of the upstream and downstream areas of Lewis and Clark Project.

**PAST MANAGEMENT:** The powerhouse, spillway, and dam are the operational structures essential to the project purposes of flood control, navigation, and hydropower. Routine maintenance of powerhouse structures and equipment is an ongoing function of personnel organized under the direction of the project engineer. Several hundred piezometers and tilt meters are monitored around project lands to monitor hydraulic head and movement of the dam embankment to ensure dam safety. Vegetative management of the dam involves regular mowing and has included burning portions of the embankment slope in the spring to increase vigor of the grasses and discourage the growth of weeds. The entire shoreline within this unit along the face of the dam has been protected from wave action and erosion through the use of riprap and/or rock gabions. There are several encroachments related to advertisement signs and minor fences or structures that were identified in this unit. These are all located on the north side of Highway 52 and associated with the many businesses located in the lake area. Minor encroachments have been resolved by project personnel with the remaining few referred to the Real Estate Office for action. The area of the unit located north of SD Highway 52 and the project boundary serves as a storage area for dam safety emergency operation's riprap and gravel stockpiles.

**REAL ESTATE OUTGRANTS:** Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.53. NE HIGHWAY 121 R.O.W. Management Unit**

MANAGEMENT UNIT NUMBER: 53 (OMP # 0052010100)

LAND USE CLASSIFICATION: Operations

LOCATION: Management unit is located on USGS quad map Gavins Point Dam, Cedar County, Nebraska, Township 33 North, Range 1 West, Sections 8, 14, 15, 16, and 17. This unit is a thin piece of land consisting of the Nebraska Highway 121 right-of-way and a smaller portion of land lying north of the highway to the bank of the Missouri River.

SOILS INFORMATION: The soils are of the Sarpy Blake Albaton association which are sandy, silty clay soils formed in alluvial deposits of the former floodplain. Special construction techniques are needed to elevate structures, compact soil, or provide for drainage around buildings and structures located on these soils. They are well suited for wildlife plantings and in general have moderate permeability. Refer to the Soil Survey of Cedar County, Nebraska for more specific soils information.

VEGETATION: The western portions of this unit contain some upland habitat with oak cedar species dominating the drainage areas. Turf consisting predominantly of brome grass is maintained along roadways in the unit. The remainder of the unit is comprised primarily of cottonwood, ash, and Chinese elm trees accompanied by several woody shrub species.

WILDLIFE: The habitat found in this unit supports wildlife game species such as whitetail deer, turkey, quail, squirrel, and rabbit. The unit has a relatively small land base and capacity to support many species within its boundary. The western portions of the unit containing the woody draws are of special significance with regard to serving as a buffer zone between adjacent residential development and the highways within the unit. Endangered bald eagles, golden eagles, owls, and other raptors pass through the unit and prey upon small rodents and animals.

RECREATION: Little recreation use is made of this unit with the exception of intermittent walking and hiking along the riverbank. There are no developed recreation facilities within this unit.

PAST MANAGEMENT: This parcel of land was originally acquired to allow for the



construction of a road to service vehicle and equipment transport during the construction of Gavins Point Dam. The vast majority of the unit has been outgranted to the state for right-of-way purposes and the Nebraska Department of Roads maintains the highway which is a two-lane bituminous road. There is an agriculture encroachment at the intersection of Highways 81 and 121 due to the location of fences and the highway right-of-way boundaries. A small parcel of government land located adjacent to Aten Resort has been requested by the owner to be exscessed by the Corps to resolve past encroachment problems and to allow the resort to operate and expand rental cabins in the area. The Lake Office concurred with this request and requested action by the Real Estate Office to sell this land but no further action has been taken on this issue as of this date.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.54. CHIEF WHITE CRANE Management Unit**

PREVIOUSLY MANAGEMENT UNIT NUMBER: 53 (OMP # 0053010200)

Transferred to SDGFP per Title VI.

#### **6.2.55. USFWS HATCHERY & LAKE YANKTON Management Unit**

MANAGEMENT UNIT NUMBER: 55 (OMP # L055010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Gavins Point Dam, Yankton County, South Dakota, Township 93 North, Range 56 West, Sections 16 and 17 and Cedar County Nebraska, Township 33 North, Range 1 West, Sections 7 and 8. This unit consists of the grounds surrounding the Gavins Point Dam National Fish Hatchery and Aquarium and also Lake Yankton with the exception of the island area located within the water area.

SOILS INFORMATION: The soils are of the Forney Haynie Sarpy association and consist of deep and level, moderately drained to poorly drained, clay and sandy floodplain soils. Refer to the Soil Survey of Yankton County, South Dakota for more specific soils information.

**VEGETATION:** Vegetation within this unit varies widely from highly maintained bluegrass turf around the aquarium buildings and grounds to low maintenance turf in the open fields located in the northern and western portions of the unit. There is also some agricultural crops that are grown and harvested within the unit and consist mainly of alfalfa and corn. Small clumps of native trees are scattered throughout the unit and also occur along the fenced boundaries of the unit. Landscape plant and tree species have been introduced around the buildings and grounds of the hatchery and aquarium. Dense stands of cattail are present within the water portions of the unit and stands of cottonwood and willow are present along the lakeshore.

**WILDLIFE:** The habitat found in this unit supports wildlife game species such as whitetail deer, waterfowl, turkey, squirrel, and rabbit. The south and eastern portions of the unit containing the woody vegetation and agricultural crops are of a special significance with regard to serving as a buffer zone between a residential development and SD Highway 52 adjacent to the unit. Bald eagles, golden eagles, osprey, owls, and other raptors pass through the unit and prey upon fish, rodents, and small game. Lake Yankton, which makes up a significant portion of this unit, supports many species of fish, reptiles, and amphibians. A joint management team made up of representatives of the Corps, USFWS, and the SDGFP governs the fishery and other cultural practices carried out for management of the lake.

**RECREATION:** The aquarium is open to the public from April 1 to December 1 but receives most visitations during the summer recreation season. There are 13 large fish observation tanks that are stocked with native fish species. The public can also observe hatchery operations during normal working hours at the site through observation windows as well as during tours of the complex. Visitation to the aquarium and hatchery totals 80,000 to 100,000 individuals during the year. A section of the hike/bike trail system between the city of Yankton and the lake area intersects this unit and is frequently traveled during the year, mostly by bicyclists.

**PAST MANAGEMENT:** The 230-acre complex site within this unit is managed by the U. S. Fish and Wildlife Service through a permit granted by the Corps of Engineers in 1956. This permit also includes 351 additional acres of land and water that comprises Lake Yankton. The hatchery originally contained 20 fish rearing ponds but six smaller 0.2-acre ponds were added in subsequent years of operation until the 1980s. In 1983, 10 additional lined ponds were built, raising the total number of ponds to 36. Thirteen species of fish are raised at this site and are

transported to reservoirs located on Federal property, reservation land, and state managed waters. Some feed for the fish is obtained by utilizing the alfalfa fields located just south of the aquarium. A crop/share agreement has been arranged between the Service and a farmer whereby cuttings of alfalfa are turned over to the hatchery in exchange for the cropping of other agricultural land located within the permit area.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.56. LAKE YANKTON ISLAND Management Unit**

MANAGEMENT UNIT NUMBER: 56 (OMP # O56010502)

LAND USE CLASSIFICATION: Multiple Resource – Wildlife Management

LOCATION: Management unit is located on USGS quad map Gavins Point Dam, Yankton County, South Dakota, Township 93 North, Range 56 West, Section 21. This area is the large island that is located in the central portion of Lake Yankton.

SOILS INFORMATION: The soils are of the Forney Haynie Sarpy association and consist of deep and level, moderately drained to poorly drained, clay and sandy floodplain soils. Refer to the Soil Survey of Yankton County, South Dakota for more specific soils information.

VEGETATION: The island was originally a Missouri River sandbar, and it began to be vegetated during dam construction in the 1950s. In the center of the island are very thick stands of cedar trees; Russian olives, dogwoods, and cottonwoods also grow here. The wetlands near Lake Yankton contain willows, cattails, bulrushes, horsetails, sedges, reed canary grass, and switch grass.

WILDLIFE: Eagles and osprey perch in the cottonwoods; the dead cottonwoods are nesting sites to multiple types of woodpeckers and sites for nesting bluebirds. Other wildlife includes whitetail deer, beaver, hawks, owls, ducks, and geese (Donahue 2000). A steady population of mammals, including opossum, skunks, fox, squirrels, marmosets, and mink, live and travel

between White Chief Crane and the island. Wild turkeys have been known to roost in the trees. The island is the only woodcock-nesting site in South Dakota, and the woodcock was nesting there in the spring of 2000. The only known least bittern nest in South Dakota was found on the island in 1990-91 (Kruse 2000)

**RECREATION AND PAST MANAGEMENT:** The island is used by deer bow hunters and waterfowl hunters in the fall months and is available for use for furbearer trapping. Primitive camping has been allowed in the past with the requirement for a special use permit.

**REAL ESTATE OUTGRANTS:** There are no out grants in this management unit.

### **6.2.57. DOWNSTREAM DAY USE AREAS Management Unit**

**MANAGEMENT UNIT NUMBER:** 57 (OMP # 0057010200)

**LAND USE CLASSIFICATION:** Recreation

**LOCATION:** Management unit is located on USGS quad maps Yankton and Gavins Point Dam, Township 33 North, Range 1 West, Sections 7 and 8, Cedar County, Nebraska and Township 93 North, Range 56 West, Sections 17, 20, and 21 located in Yankton County, South Dakota. This unit encompasses all of the day use/picnic areas located downstream of the dam along the left bank of the Missouri River.

**SOILS INFORMATION:** The soils are of the Forney Haynie Sarpy association and consist of deep and level, moderately drained to poorly drained, clay and sandy floodplain soils. Refer to the Soil Survey of Yankton County, South Dakota for more specific soils information.

**VEGETATION:** Vegetation within this unit varies widely from highly maintained turf within the campgrounds and play areas to low maintenance turf in the open fields, along the roads, and along Lake Yankton. Native cottonwood, ash, and cedar trees as well as several indigenous shrub species can be found throughout the unit and occur mainly along the unit border with Lake Yankton. Landscape plants and trees have been introduced around the buildings and grounds in the more developed portions of the unit.

**WILDLIFE:** This unit is not managed extensively for wildlife species but small furbearers such as squirrel, rabbits, and a large variety of songbirds do utilize the resources of the area. Whitetail deer are present within the unit in varying concentrations depending on hunting pressure and reproduction cycles. Waterfowl utilize portions of the unit that lie adjacent to Lake Yankton and the Missouri River. The native tree and shrub stands within the unit serve as a buffer zone or edge habitat for wildlife species between adjoining recreational facilities.

#### RECREATION AND PAST MANAGEMENT:

*Training Dike Area:* The Training Dike area links Chief White Crane to the rest of the downstream recreation areas. It is located between the southern edge of Lake Yankton and the Missouri River and is approximately one mile in length. Though this area appears to be part of South Dakota because of its location on the north bank of the present river channel, it is part of Nebraska because state and county boundaries were established before construction of the dam. The training dike was constructed to direct water discharges from the dam downstream in a distinct channel. Lake Yankton was formed as a result of this dike which also has a controlled outlet works located near its eastern end to allow for the manipulation of elevation of the lake and also to regulate flows from the lake into the river. Prior to the construction of the dam, the original channel of the Missouri River flowed through this area of the project.

The area provides visitors with many opportunities for day use activities. Boat ramps provide access to both Lake Yankton and the Missouri River. A designated beach area is located on the Lake Yankton shoreline approximately halfway along its length. A change house with running water and showers is available. Several picnic shelters and vault toilets are located along the northern side of the dike as well as dispersed picnic tables and playground equipment. A handicap fishing pier is also located in Lake Yankton. Fishermen make use of the shoreline both along Lake Yankton and the river for shore fishing and there are several walkways that lead from the road surface down to the water's edge. One of the more popular fishing spots is downstream of the spillway gates from atop a concrete retaining wall known locally as the "fishing wall." A waterborne fish cleaning station and a comfort station are located along the roadway near the dam in the western portion of the training dike. This area is open to the public year-round.

*Cottonwood Day Use Area:* This area is located immediately north of Cottonwood

Campground and provides visitors access to Lake Yankton. The facilities include a boat ramp, large group picnic shelter that can be reserved, sand volleyball court, playground equipment, vault toilet, and open grass play areas for various activities. The edges of the area adjacent to the shoreline of Lake Yankton are utilized by both shore fishermen and waterfowl hunters. This area is open to the public year-round.

*Pierson Ranch Day Use Area:* The day use areas of Pierson Ranch surround the campground that is centrally located and is distinctly separated from the day use areas by a split rail fence. The main body of this area lies north of the campground between and south of S.D. Highway 52. The second portion lies to the east and south of the campground to the shoreline of Lake Yankton. Shore fishing is popular in the latter locality and a small parking area and park benches are provided for visitors using the area. A biking/hiking hard-surfaced trail traverses this unit from the recreation areas above the dam, through Pierson Ranch and on east paralleling Highway 52 to the city of Yankton. That parcel of land lying north of the campground contains the bulk of facilities and consequently receives most of the visitation in this section of the recreation area. There are two small picnic shelters for small family gatherings and also two large group shelters which may be reserved or are available on a first come, first serve basis on other dates. There is one comfort station that serves as a common area for both picnic shelters. Two baseball backstops are located in this area, one directly behind one of the group shelters and one located on the eastern edge of a large open playing field which runs the length of this land parcel. There are two horseshoe pits, a sand volleyball court, tennis courts, basketball courts, and various other playground equipment in this area. A sanitary dump station is located at the extreme eastern border of the area and receives heavy and frequent use throughout the recreation season. This area is open to the public year-round.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

#### **6.2.58. PIERSON RANCH Management Unit**

MANAGEMENT UNIT NUMBER: 58 (OMP # 0058010200)

Leased in perpetuity to SDGFP per Title VI.

LAND USE CLASSIFICATION: Recreation

**LOCATION:** Management unit is located on USGS quad map Gavins Point Dam, Township 93 North, Range 56 West, Section 17 in Yankton County, South Dakota. This unit is the Pierson Ranch campground area.

**SOILS INFORMATION:** The soils are of the Forney Haynie Sarpy association and consist of deep and level, moderately drained to poorly drained, clay and sandy floodplain soils. Refer to the Soil Survey of Yankton County, South Dakota for more specific soils information.

**VEGETATION:** Vegetation within this unit consists of maintained turf grasses, native cottonwood, ash, walnut, catalpa, and cedar trees as well as several introduced species such as apricot and pine. Landscape plants have been planted around the buildings and grounds in the unit.

**WILDLIFE:** This unit is not managed extensively for wildlife species but small furbearers such as squirrel, rabbits, and a large variety of songbirds do utilize the resources of the area. Whitetail deer are present within the unit in varying concentrations depending on hunting pressure and reproduction cycles. The native tree and shrub stands within the unit serve as a buffer zone or edge habitat for wildlife species between adjacent recreational facilities.

**RECREATION AND PAST MANAGEMENT:** Pierson Ranch is located downstream of the dam, situated north of Lake Yankton and south of South Dakota Highway 52. It is accessed from the highway along a project roadway that then becomes the dam toe road. The area historically was the site of a working cattle ranch before being purchased by the government for the Lewis and Clark/Gavins Point Dam Project.

There are 68 campsites with electrical service and 6 non-electric campsites in the campground. One loop of electrical campsites in this area can be reserved by the public through the campsite reservation program. Contract gate attendants collect fees during the summer recreation season and post those sites that have been reserved in advance of the visitor's arrival at the lake. Facilities within the area include two comfort stations, vault toilet, and playground equipment. The comfort stations were rehabilitated in 1992 by the addition of new partitions and glass board to the interior and the addition of metal facia board and finished soffits on the exterior of the buildings. This campground is open only through the summer recreation fee season.

REAL ESTATE OUTGRANTS: Site includes real estate outgrants. See current OMP for current details on outgrants.

### **6.2.59. COTTONWOOD Management Unit**

MANAGEMENT UNIT NUMBER: 59 (OMP # 0059010200)

LAND USE CLASSIFICATION: Recreation

LOCATION: Management unit is located on USGS quad map Gavins Point Dam, Township 93 North, Range 56 West, Section 20 in Yankton County, South Dakota. This unit is the Cottonwood campground area.

SOILS INFORMATION: The soils are of the Forney Haynie Sarpy association and consist of deep and level, moderately drained to poorly drained, clay and sandy floodplain soils. Refer to the Soil Survey of Yankton County, South Dakota for more specific soils information.

VEGETATION: The predominant vegetative feature of this unit, hence the name, is a mature stand of native cottonwood trees which existed within the Missouri River floodplain before the construction of the dam. Additional vegetation found in this unit consists of maintained turf grasses, ash, and cedar trees as well as several native and ornamental shrub species. Landscape plants have been introduced around the buildings and grounds in the unit.

WILDLIFE: This unit is not managed extensively for wildlife species but small furbearers such as squirrel, rabbits, and a large variety of songbirds do utilize the resources of the area. Whitetail deer are present within the unit in varying concentrations depending on hunting pressure and reproduction cycles.

RECREATION AND PAST MANAGEMENT: This area is located downstream of the dam at approximately its midpoint, and is accessed by the dam toe road. The campground contains three camping loops that provide 77 electrical campsites. One loop of electrical campsites in this area can be reserved by the public through the campsite reservation program. Contract gate attendants collect fees during the summer recreation season and post those sites that have



been reserved in advance of the visitor's arrival at the lake.

Facilities within the area include two comfort stations, a group picnic shelter, vault toilet, and playground equipment. The comfort station in the north loop of the campground was rehabilitated during 1992 by the addition of new partitions and glass board to the interior and the addition of metal fascia board and finished soffits on the exterior of the building. During 1992, a new loop was added to this campground that contains 15 campsites. Overall, the total number of campsites in the unit declined by one due to the elimination of some sites which had previously occupied some of the remodeled area and some which were located very close to other existing pads. Impact area treatment was performed at 33 sites located in both the new loop as well as a former non-electric loop. Electrical service and asphalt-surfaced roads were added to both the loops.

A new picnic shelter and playground was constructed within the campground and an old shelter and vault toilet dismantled and removed from the area. This campground has remained open for use year- round although no services or waterborne facilities are available during the late fall through early spring season. Self-registration camping may be utilized after gate attendant contracts have ended for the summer. Shoreline fishing and ice fishing on Lake Yankton are popular activities in this unit.

REAL ESTATE OUTGRANTS: There are no outgrants within this unit.

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## **7. CONCLUSIONS**

This Master Plan presents an overall plan for the management and development of the resources at the Gavins Point Dam/Lewis and Clark Lake project. It also provides guidance on public use, natural areas, and cultural resources within the project boundaries. Preparation of this plan required (1) an appraisal of the natural and cultural resource conditions of the project and the surrounding region, and (2) an examination of environmental and administrative constraints and influences. Specific references to these factors can be found in the environmental assessment (Appendix B).

Sound stewardship of public lands requires development and management of project resources for the public benefit consistent with resource capabilities. An important element of this approach is the establishment of viable resource objectives. This Master Plan recommends a broad range of resource objectives and management and development concepts covering the overall project, as well as specific areas within it. These recommendations are summarized below.

### **7.1. PROJECT OPERATIONS LANDS**

Continue to ensure that all project purposes (flood control, navigation, hydropower, fish and wildlife, recreation, irrigation, and municipal and industrial water supply) are carried out.

### **7.2. RECREATION LANDS**

Maintain and/or improve existing recreation facilities administered by the Corps and provide safe, enjoyable recreation opportunities;

Develop interpretive displays to identify and explain the natural, cultural, and historical significance of areas around the project; and

Lease identified project lands to qualified non-Federal sponsors for facilities development and provide technical, advisory, and administrative support as needed.

### **7.3. MULTIPLE RESOURCE MANAGEMENT LANDS**

Develop, maintain, and/or upgrade facilities at low-density use areas to provide safe and enjoyable recreational experiences;

Preserve and maintain existing riparian vegetation wherever possible; and

Continue a vegetative planting program to improve wildlife habitat, visual quality, and shoreline stability.

### **7.4. ENVIRONMENTALLY SENSITIVE AREAS**

Preserve and protect unique and important ecological, cultural, and aesthetic resources.

An Operational Management Plan (OMP) is a critical element in achieving the resource objectives and associated management and development concepts specified in the Master Plan. The latest OMP for the Gavins Point Dam/Lewis and Clark Lake project was approved October 1, 1997.

Extensive Federal, State, tribal, and local agency coordination and citizen involvement was incorporated in all aspects of this Master Plan. Planning for the development, preservation, or enhancement of project resources will continue to be coordinated through other governmental agencies and special interest groups to ensure the efficient and timely implementation of the resource objectives.

## **8. RECOMMENDATIONS**

It is recommended that this updated Master Plan guidance be closely followed in managing the land and water resources at the Gavins Point Dam/Lewis and Clark Lake project. The plans and policies within this Master Plan are consistent with authorized project purposes and resource capabilities and accommodate Federal, state, tribal, and local needs. They represent wise stewardship of resources and will result in increased opportunities for enjoyment of outdoor recreation activities as well as providing wildlife habitat; improving visual quality; and protecting unique and important ecological, cultural, and aesthetic resources.

The continued cooperation with state and local interests to preserve and improve the natural and manmade resources at the Gavins Point Dam/Lewis and Clark Lake project will provide improved outdoor recreation opportunities in South Dakota and Nebraska for future generations of both residents and nonresidents.

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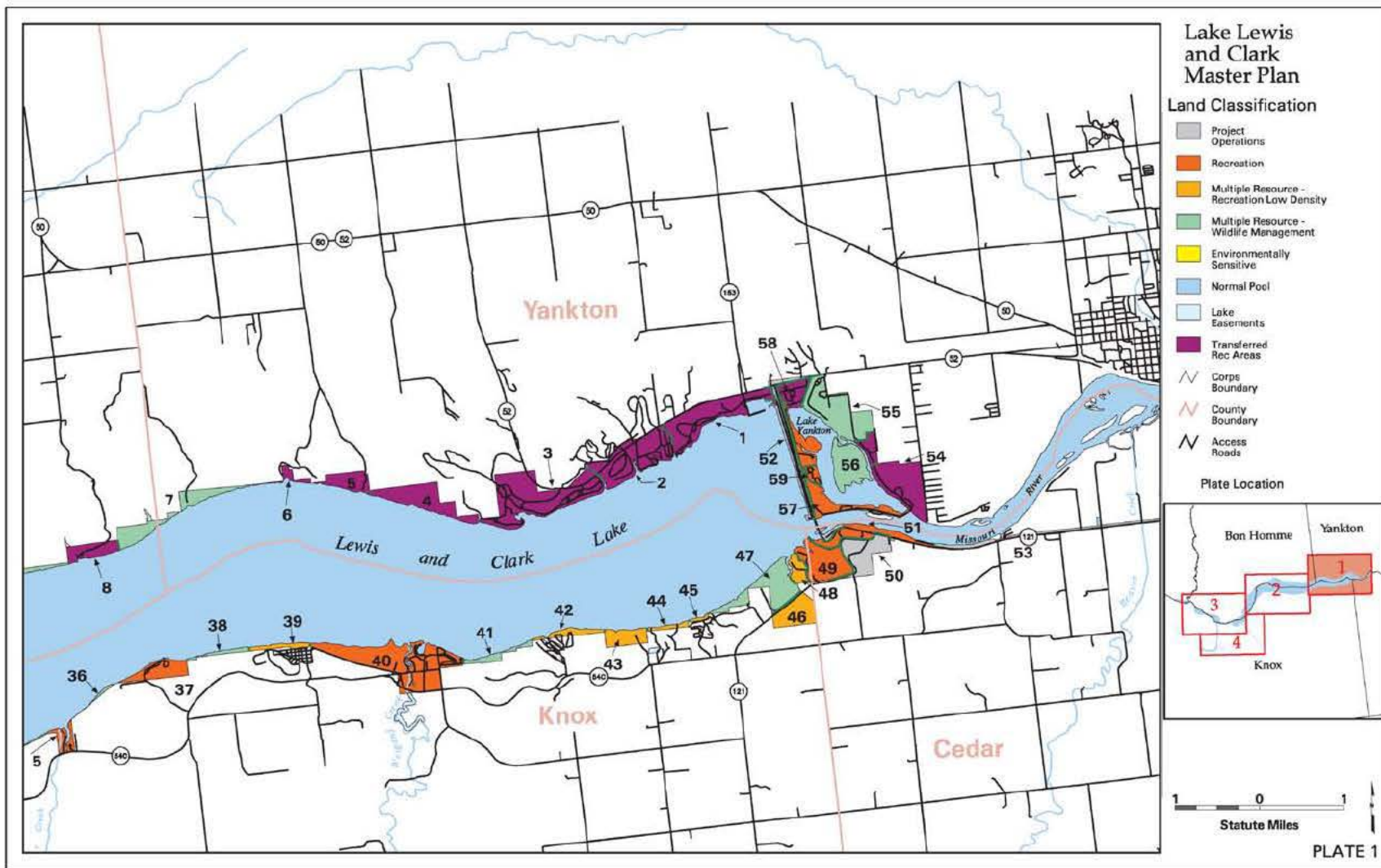
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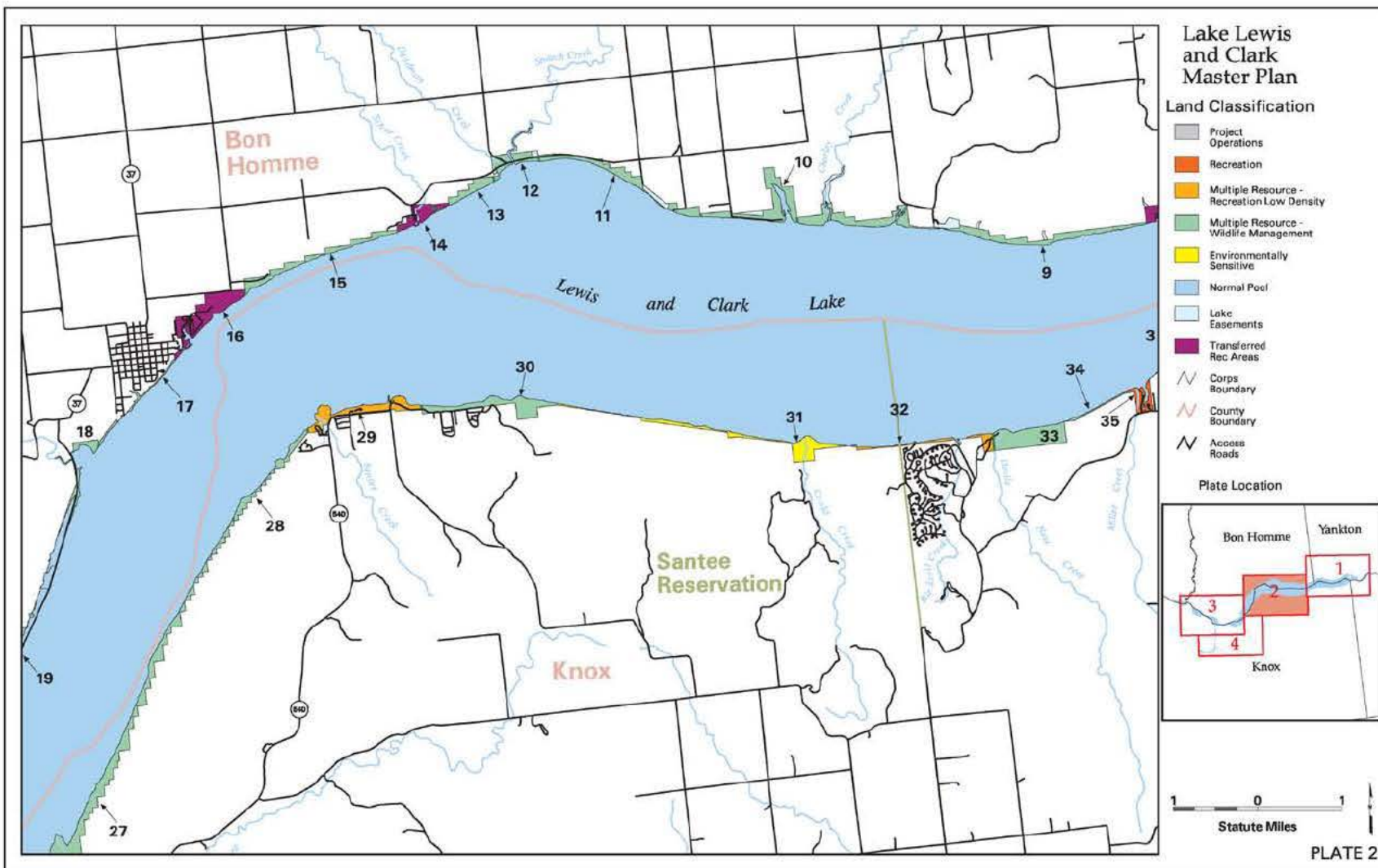
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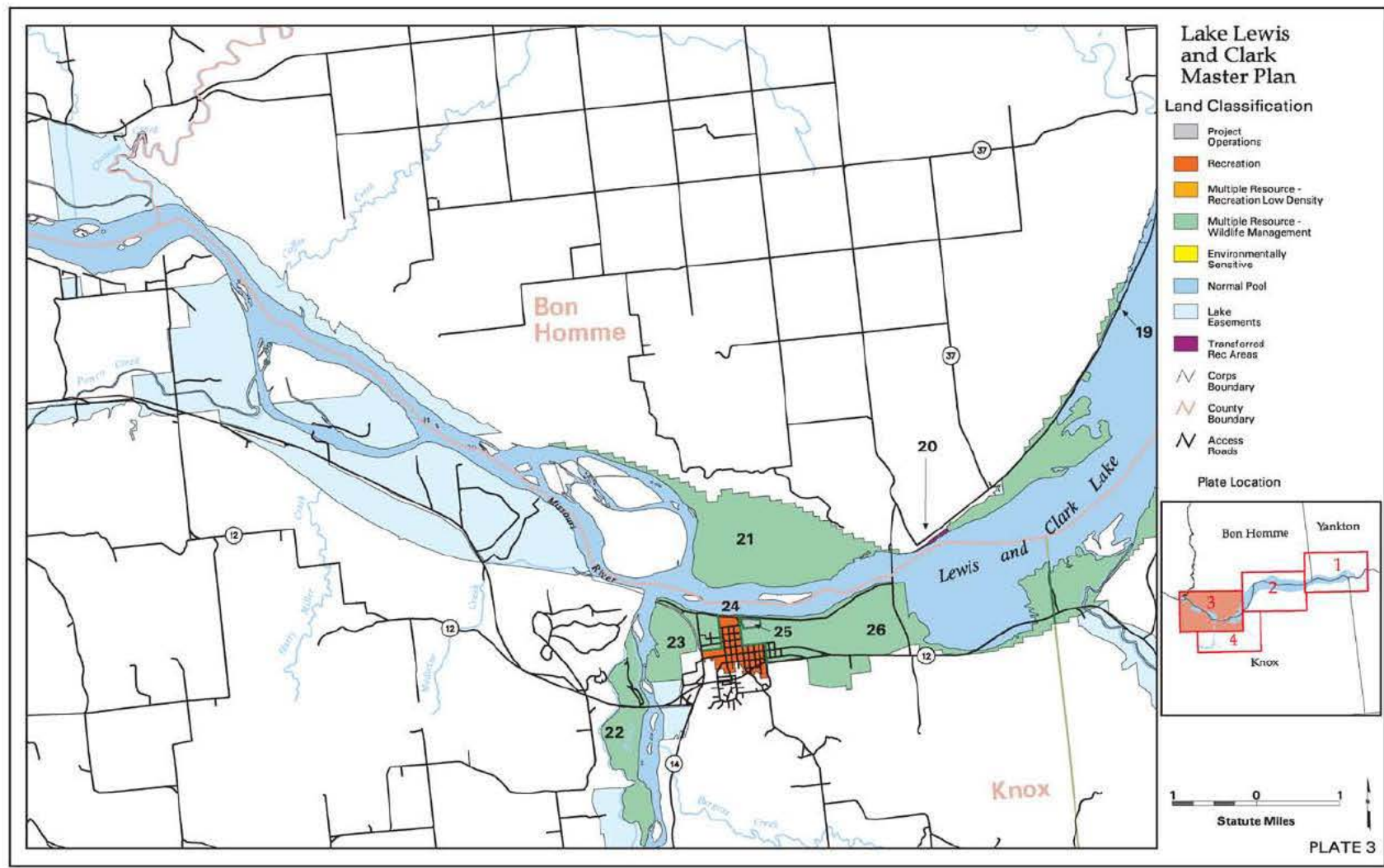
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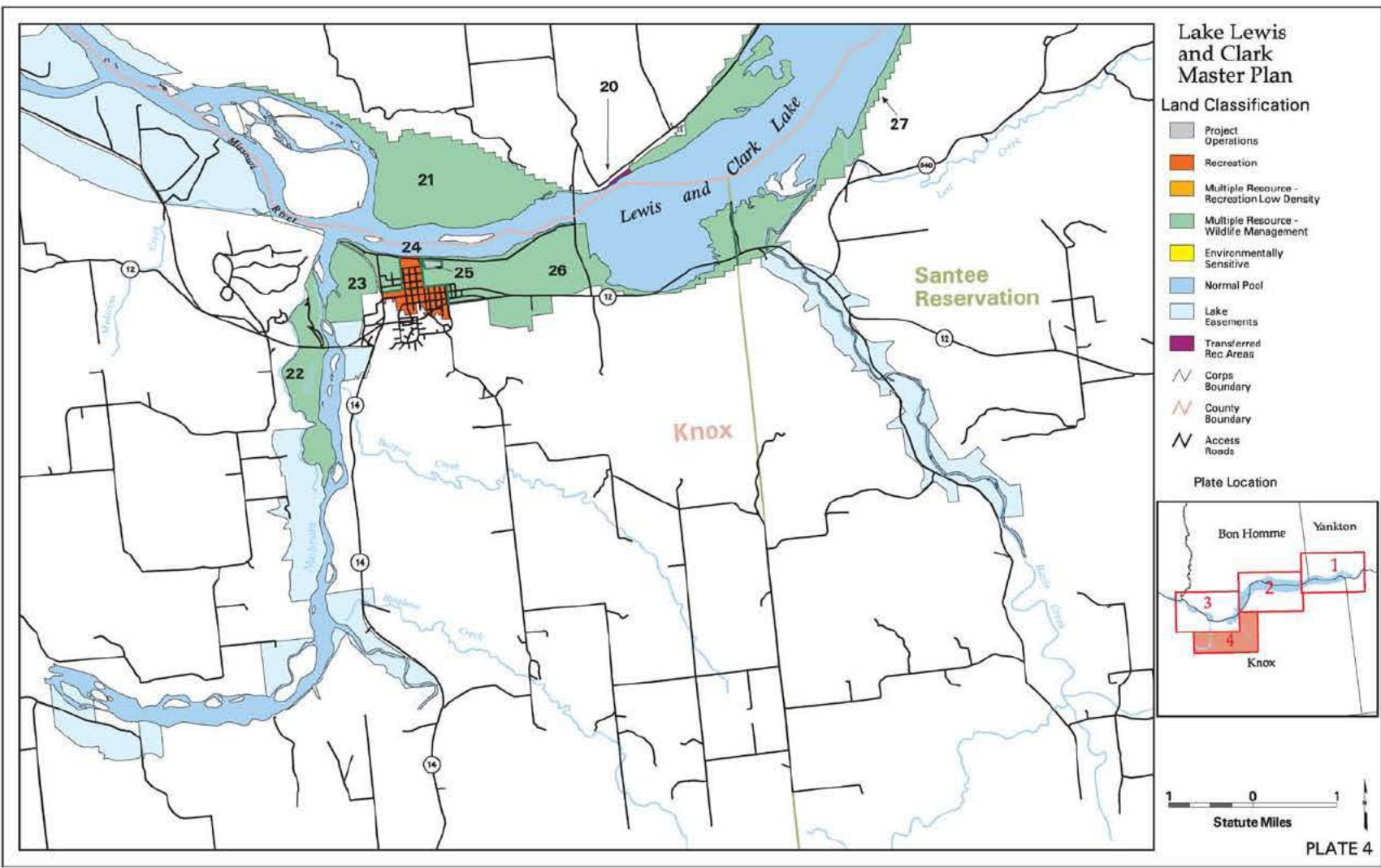
**APPENDIX A: LAND CLASSIFICATION PLATES**  
**GAVINS POINT PROJECT**











## **APPENDIX B: ENVIRONMENTAL ASSESSMENT**

### **GAVINS POINT PROJECT**



# **ENVIRONMENTAL ASSESSMENT**

**For the Missouri River, South Dakota and Nebraska**

**Gavins Point Dam and Reservoir Master Plan**



**OMAHA DISTRICT CORPS OF ENGINEERS**

**June 2004**

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## **1.0. THE PROPOSED PROJECT**

### **1.1. Location**

The Gavins Point Dam/Lewis and Clark Lake project is located in Bon Homme and Yankton Counties in southeastern South Dakota and Cedar and Knox Counties in northeastern Nebraska. The dam is 4 miles west of Yankton, South Dakota. Other nearby towns include Springfield, and Tabor, South Dakota and Crofton, and Niobrara, Nebraska.

At maximum normal operating pool level, (1,204.5 feet mean sea level (m.s.l.)), Lewis and Clark Lake extends roughly 25 miles from Gavins Point Dam, 4 miles west of Yankton, South Dakota, to near Springfield, South Dakota. At this level, the lake covers approximately 31,400 acres and has over 90 miles of shoreline. Additional Corps fee-owned lands surround the reservoir and contain such facilities as the dam embankment, powerhouse, maintenance facilities, recreation facilities, mitigation lands, and wildlife habitat.

### **1.2. Purpose and Need for the Master Plan**

The Gavins Point Dam/Lewis and Clark Lake project was authorized under Section 4 of the Flood Control Act approved 22 December 1944, as amended, Public Law 78-534. Public Law 710, 83d Congress, officially named the reservoir behind Gavins Point Dam as Lewis and Clark Lake. The first Master Plan for Lewis and Clark Lake was approved in December 1964 for the purpose of providing flood control, irrigation, domestic and sanitary water supply, navigation, hydropower, recreation, and fish and wildlife management. The 1964 Master Plan is of limited use in guiding project development and resource use because of the many changes in recreational demand and use patterns. As a result, several supplements have been made to the 1964 document. An update to the first Master Plan was submitted in 1977 and was approved in 1978. In 1988, the Corps again updated the Master Plan (Design Memorandum MG-123). In 2002, another change in land allocation and jurisdiction occurred (Title VI Land Transfer), resulting in the re-initiation of the Master Plan update. The changes made as a result of the Title VI Land Transfer were described in an Environmental Impact Statement (EIS), which concluded that no significant cumulative impacts would be expected as a result of the land transfers (USACE 2001a). In addition, an Environmental Assessment (EA) for the lease of 22 recreation areas within the project area to South Dakota was also prepared in 2000 and resulted in a finding of no significant impact (USACE 2000). An EA for the previous 1964 Master Plan was not required because it was written prior to the National Environmental Policy Act (NEPA). This EA is intended to address the changes that will be made to land allocation and management as a result of the update of the 1988 Master Plan, but will not address the land transfers already assessed in the EIS or the land leases assessed in the EA.

The updated Master Plan will provide guidance for stewardship of natural resources, and management for long-term public access to, and use of, the natural resources of Lewis and Clark Lake. The Master Plan provides a comprehensive description of the project, a discussion of factors influencing resource management and development, an identification and discussion of special problems, a synopsis of public involvement and input to the planning process, and descriptions of past, present, and proposed development.

Since the adoption of the 1988 Master Plan, many Corps policies have been revised, visitation and resource conditions have changed, and several laws and regulations that apply to the area have been passed. These changes have been incorporated into the Master Plan update.

## **2.0. ALTERNATIVES**

### **2.1. Alternative 1: No Action**

Under this alternative, an updated plan would not be approved for the project in the foreseeable future and the previous 1988 Master Plan would continue to provide the only source of comprehensive management guidance and philosophy. Information provided in the aforementioned documents is out of date because of significant changes in project use conditions, pertinent laws and policies, visitor use and public demand, among others.

Under the existing Master Plan, development and management of the project area will likely take the same general direction outlined in the updated Master Plan. However, future major developments or resource management policies would require approval on a case-by-case basis without the benefit of evaluation in the context of an overall plan.

For this EA, the “No Action” alternative is assumed to not achieve the potential of effective resource management of the Lewis and Clark Lake project as proposed. The result of the “No Action” alternative is discussed in Section 4.0, Environmental Impacts of the Proposed Actions.

### **2.2. Alternative 2: Proposed Master Plan**

#### *2.2.1. Scope of the Updated Master Plan*

This alternative would result from the approval of the proposed updated Master Plan. Management of the project would be accomplished in accordance with the resource objectives outlined in the updated Master Plan. The updated Master Plan establishes appropriate resource objectives for the project, prescribes land allocations and classifications, identifies development and management needs, provides management guidelines, and establishes the locations and suitable levels of recreation development. The updated Master Plan also provides a framework for the Operational Management Plan (OMP) and Annual Management Plan, and provides a basis for reviewing outgrant and recreation development proposals. The updated Master Plan will be in effect for approximately twenty years. Supplements will be prepared as appropriate and justified.

Water management policies and procedures for the Missouri River are established by the Corps’ Northwestern Division and were most recently updated in the 2004 Missouri River Mainstem Reservoir System Master Water Control Manual (USACE 2004a). Fishery management and game hunting are predominantly under the authority of the South Dakota Department of Game, Fish and Parks (SDGFP), Nebraska Game and Parks Commission (NGPC), and Santee Sioux Tribe. The U.S. Fish and Wildlife Service (USFWS) manages migratory bird species. Therefore, water management, fishery management,

migratory bird management and hunting, and game hunting are not addressed in the updated Master Plan. The updated Master Plan focuses primarily on recreation management and the management and stewardship of natural and historic resources.

### *2.2.2. Objectives of the Proposed Action*

Certain objectives, known as “Project-Wide Resource Objectives,” have been pursued in the development of this document. These Resource Objectives include the following:

- Develop and manage land and waters in full cooperation and coordination with other public management agencies and appropriate private sectors.
- Develop and manage the Gavins Point project lands and waters to support various types and levels of recreation activities consistent with carrying capacities and aesthetic, cultural, and ecological values.
- Provide public education about the history of the area, Gavins Point project resources, and the Corps' role in developing and managing these resources.
- Develop and manage the project lands and waters to support a diversity of fish and wildlife species.
- Preserve and protect threatened and endangered species and unique and important ecological and aesthetic resources.
- Maintain and manage project lands and waters to support regional management programs.
- Protect and interpret significant cultural resource sites.
- Maintain a reservoir water supply of high quality for irrigation, water supply, recreation, fish and wildlife use.
- Manage resources in response to sedimentation trends.

### *2.2.3. Land Allocation, Land Classifications, and Resource Objectives*

Previous land classifications from the 1988 report included 1) Project Operations (316 acres), 2) Intensive Use Recreation (2,572 acres), 3) Low-Density Use Recreation (3,648 acres), 4) Wildlife Management (13,195 acres), and 5) Natural Areas (85 acres).

The updated Master Plan provides guidance on public use, water quality, natural areas, and historic properties within Corps boundaries. It affirms land classifications and management practices similar to those already in effect and describes new allocations and the resource objectives of those allocations.

All lands acquired for project purposes are classified in a manner that provides for development and resource management consistent with authorized project purposes and other Federal laws. The classification process refines the land allocations to fully utilize project lands and also considers public desires, legislative authority, regional and project-specific resource requirements, and suitability.

Land is divided into land classifications including project operations (e.g., dam, spillway, maintenance yard), recreation, mitigation, environmentally sensitive, and multiple resource management lands. The multiple resource management lands are further subdivided into any combination of the following land uses: 1) recreation low-density, 2) wildlife management general, 3) vegetative management, 4) inactive and/or future recreation, and 5) easement lands. These are further described in the paragraphs below. A complete list of existing land use areas and associated resource objectives are included in the Master Plan update.

Project Operations. This classification includes lands required for the dam and associated structures, operations center, administrative offices, maintenance compounds, and other areas that are used to operate and maintain the Gavins Point Dam/Lewis and Clark Lake project. Where compatible with operational requirements, Project Operations lands may be used for wildlife habitat management, recreational use, or agricultural activities. Licenses, permits, easements, or other outgrants are issued only for those uses that do not conflict with operational requirements. Approximately 300 acres of land are classified as Project Operations in the Master Plan update.

Recreation Lands. These lands are designated for intensive levels of recreational use to accommodate and support the recreational needs and desires of project visitors. In the Master Plan update recreation lands comprise approximately 2,295 acres of land at the Gavins Point project area. Resource objectives for management of the areas include, but are not limited to, providing for day and overnight use, opportunities for several activities in the same general vicinity, boat access, and use by handicapped and elderly persons.

Mitigation Lands. This classification includes those lands specifically designated to offset habitat losses associated with the development of the Gavins Point project. No lands are currently classified as mitigation areas. Resource objectives for managing mitigation areas include providing and maintaining high quality and diverse vegetation resources in order to provide food and shelter for wildlife and conserve soil resources, ensure that wetlands do not degrade or diminish in size, and provide wildlife habitat on all suitable lands.

Environmentally Sensitive Areas. This classification consists of areas where scientific, ecological, cultural, or aesthetic features have been identified. Development of public use on lands within this classification is normally limited or prohibited to ensure that the sensitive areas are not adversely impacted. Agricultural or grazing uses are not permitted on lands with this classification. Approximately 88.8 acres of Gavins Point project land are classified as environmentally sensitive. Resource objectives for management include

protecting and preserving scientific, ecological, cultural, or aesthetic resource sites; ensuring that no degradation or net loss of wetland areas occur; preserving and/or restoring wildlife habitat; and providing a resource-oriented recreation opportunity in as natural an environment as possible.

Multiple Resource Management Lands. These lands are managed for one or more of the activities described below. Resource objectives for these lands include providing trails for interpretive hiking; accommodating and supporting non-consumptive resources such as hiking and photography; employing good stewardship practices by increasing the use of soil conservation measures; ensuring successful natural propagation of diverse fish and wildlife species; and providing sites for future development that are adjacent to existing recreation areas and within the project boundary that meet anticipated outdoor recreation demands. Consumptive uses of wildlife, including hunting, fishing, and trapping, are allowed when compatible with the wildlife objectives for a given area and with Federal and State fish and wildlife management regulations. In the Master Plan update approximately 12,069 acres are classified as Multiple Resource Management Lands. These areas may be designated for one or more of the following uses:

- **Recreation-Low Density.** These lands are designated for low-impact recreation use. Development of facilities on these lands is limited. Emphasis is on providing opportunities for nonmotorized activities such as walking, fishing, hunting, or nature study. In the Master Plan update 4,552 acres are subclassified as Recreation-Low Density.
- **Wildlife Management General Lands.** These lands are designated for wildlife management, although all project lands are managed for fish and wildlife habitat in conjunction with other land uses. Wildlife management lands contain valuable wildlife habitat components that are maintained to yield habitat suitable for a designated wildlife species or group of species. In the Master Plan update 7,517 acres are subclassified as Wildlife Management General Lands.
- **Vegetative Management.** Management activities in these areas focus on the protection and development of forest resources and vegetative cover. The updated Master Plan does not classify any existing lands for vegetative management. However, all project lands are managed to protect and develop vegetative cover in conjunction with other land uses.
- **Inactive and/or Future Recreation Areas.** This subclassification consists of lands for which recreation areas are planned for the future or that contain existing recreation areas that have been temporarily closed. No lands are subclassified as inactive or future recreation areas in the Master Plan update.
- **Easement Lands.** This classification consists of lands for which the Corps did not acquire fee title but did acquire (1) the right to enter onto the property in connection with the operation of the Gavins Point project and (2) the right to occasionally flood the property. Planned use and management of easement lands will be in strict accordance with the terms and conditions of the easement estate acquired for the project. There are 89 easements for rights-of-way for waterlines, roads, and gas lines throughout the project.



#### 2.2.4. *Proposed Development*

The updated plan proposes some actions for the combined purposes of improving recreation and protecting and enhancing the natural resources found in the project area. The following is a short synopsis of the general types and purposes of the actions that are either proposed in the Master Plan update or may be proposed in the future.

Facilities Construction. Roads, campsites, docks, marinas, hiking trails, interpretive signage, toilets, playground equipment, fish tables, parking lots, and boat ramps are just a few of the developments proposed for the Lewis and Clark Lake project. In general, construction is focused into recreation areas or is designed to concentrate human access onto identified roads and pathways to prevent random access. At sites where many measures are proposed, the updated plan recommends that a site plan be prepared prior to expansion of recreation facilities.

Planting Trees and Shrubs. Trees and shrubs would be planted to increase winter cover, woody vegetation, food sources for wildlife, and the amount of dense nesting cover for upland game. Vegetation buffers would be created to separate cultural and natural resource areas from recreation and public use areas. Buffers along the lake shoreline would assist in preventing erosion and provide additional wildlife habitat.

Establish Food Plots. Food plots would be established to supplement native food sources for waterfowl, migrant bird species, big game, and upland game species. Existing food plots range between 3 and 20 acres and typically consist of a monotypic stand of row crops, such as oats, wheat, corn, or sunflowers. Food plots are planted on previously farmed lands acquired by the Corps.

Create Wetlands. Construct water collection ponds where feasible to increase the wetland habitat in the area for migratory waterfowl.

Erosion Control. Bank stabilization techniques would be implemented along the lake shoreline for erosion control, including anchoring logs and snags, grading bank slopes where possible, and planting cattails, bulrushes, and trees.

Other Actions. Several other unique actions are proposed, including prescribed burns, removal of submerged timber, noxious weed removal, and other site-specific improvements.

### 3.0. **AFFECTED ENVIRONMENT**

#### 3.1. *Geology and Soils*

Bedrock in the project area consists principally of flat-lying Cretaceous and Tertiary strata, with some exposures of early Quaternary formations. In ascending order, they are the Cretaceous Carlile Shale, Niobrara Chalk, and Pierre Shale Formations; the Tertiary Ogallala Formation; and the Quaternary Grand Island Formation (USACE 2004b). Glacial till, wind-blown silt, and sand cover comprise the surfaces layer of the project area. Pierre Shales underlie glacial till and forms broad slopes along tributaries and above the Niobrara Chalk bluffs. Niobrara Chalk is the most prominent bedrock formation in the project area with white to light brown bluffs found in the lower reservoir area. The Niobrara formation consists of limestones, shales, marl, and siltstones.

A soil association is a group of soils geographically associated in a characteristic repeating pattern. It normally consists of one or more major soils, and the association is named for the predominant soils. There are 11 soil associations found on the Gavins Point Project: Crofton-Alcester, Sarpy-Blake Albaton, Redstone-Gavins, Crofton-Boyd-Ethan, Forney-Haynie-Sarpy, Fluvauquents-Sarpy, Eltree-

Yankton-Alcester, Ethan-Boyd-Thurman, Labu-Bristow, Hord-Hobbs, and Gibbon-Leshara (USACE 2004b). These soil associations are briefly described in the Master Plan update and described in detail in the county soil surveys for Cedar and Knox Counties, Nebraska and Bon Homme and Yankton Counties, South Dakota, published by the U.S. Department of Agriculture in cooperation with State and county agencies.

### 3.2. *Water and Water Quality*

The Corps monitors water quality in Lewis and Clark Lake at three points, including locations near Gavins Point Dam, Springfield, and power houses (USACE 2004c). Releases from the dam are also monitored for water quality (USACE 2004c). The Niobrara River and Bazille Creek are the major tributaries to Lewis and Clark Lake and are monitored by the United States Geological Survey (USGS). Designated uses of water from Lewis and Clark Lake include a warmwater fishery, drinking water, and recreation and industrial uses. Lewis and Clark Lake is not on the 303(d) List of Impaired Water Bodies in either South Dakota or Nebraska (USACE 2004c). However, dissolved oxygen levels are at times depressed during summer stratification (USACE 2004c). In addition, arsenic, iron, mercury, manganese, and lead concentrations are at times elevated and exceed State water quality standards' criteria (USACE 2004c).

### 3.3. *Vegetation*

The region in which the Gavins Point project is located is largely dominated by the tallgrass and midgrass prairie ecosystems. Grasslands exist mainly on the upland ridgetops of the project lands and extend outward from the project onto the adjacent private lands. In the undisturbed areas of the project, these native grassland species reflect a transition between tallgrass and midgrass prairie and are characterized by big bluestem, little bluestem, western wheatgrass, and slender wheatgrass. On more sandy soils, needlegrass and side-oats grama dominate. In disturbed areas, brome and various foxtail species are commonly found. Many forb species that are normally associated with transitional grasslands in this area are found both in the undisturbed and disturbed areas.

There are few woodlands in the project area. Those that do exist are primarily restricted to deep ravines and steep hillsides of the dissected uplands. Although an extension of the eastern deciduous forest exists on project lands, this habitat type is not prevalent in the region. Eastern red cedar has invaded the forest stands and has become the dominant tree species in the area. Lesser areas are dominated by an association of bur oak, green ash, and American elm. Bottomland communities are dominated by eastern cottonwoods, green ash, and box elder. Willows are commonly found along the lakeshore and in small drainages. Shrub thickets exist separately and in zones along these woodlands and contain dogwood, western snowberry, wild plum, prickly ash, and smooth sumac.

### 3.4. *Aquatic Resources*

Aquatic resources at the project include the lake and its shorelines, wetlands, deltas and bays, riparian areas, seepage areas downstream of the dam, and small upland ponds. Wetlands and other aquatic areas are affected primarily by reservoir water levels, precipitation, erosion, and sedimentation.

Wetlands at the project are primarily located at the Lewis and Clark Lake Delta at the head of the

reservoir and at deltas of significant tributaries of the reservoir. In riparian wetland areas, cottonwood is the dominant tree; green ash, dogwood, and snowberry dominate the shrub community; and scouring rush is the common ground cover. Less extensive wetland areas are found at the mouths of small creeks flowing into the lake. These marginal wetlands are dominated by cattail marshes. Purple loosestrife is a noxious aquatic plant that has infested about one-half of the delta area in varying degrees.

The National Wetlands Inventory (NWI) identifies the wetlands located in the Lewis and Clark Delta and smaller wetlands located directly downstream of Gavins Point Dam; however, smaller wetland areas are likely not identified by the NWI (NWI 2002). Wetlands present include a variety of lacustrine, palustrine emergent, and palustrine scrub-shrub wetlands. Cowardin et al. (1979) provides the following definitions for each of these wetland types. Lacustrine wetlands are defined as permanently flooded lakes and reservoirs that have extensive areas of deep water and considerable wave action. Palustrine emergent wetlands are nontidal and dominated by erect, rooted, or herbaceous vegetation. Palustrine scrub-shrub wetlands are nontidal and dominated by woody vegetation less than 20 feet tall.

### 3.5. *Fish*

When Lewis and Clark Lake was created by the construction of Gavins Point Dam, the aquatic ecology of this section of the Missouri River was changed from a lotic (moving water) environment to predominantly lentic (still water) conditions. Fish species currently present in the lake represent populations from both lotic and lentic conditions. Common fish species at Lewis and Clark Lake include crappie; shovelnose and pallid sturgeon; paddlefish; shortnose gar; gizzard shad; freshwater drum; northern pike; channel, flathead, and blue catfish; white bass; common carp; blue and white sucker; river carpsucker; bigmouth and smallmouth buffalo; northern redbreast; fathead minnow; green sunfish; bluegill; white and black crappie; yellow perch; largemouth and smallmouth bass; walleye; sauger; and several varieties of shiners, including golden, emerald, and common. Brown trout are also stocked in the lake to provide a trout fishery.

The Gavins Point National Fish Hatchery and Aquarium is located downstream from Gavins Point Dam in South Dakota. The hatchery produces both warm-water and cool-water fish that will be stocked in Federal and State waters as well as in farm and ranch ponds. In 2000, the USFWS stocked 450 juvenile and 8 adult pallid sturgeon at Lewis and Clark Lake (pers. comm., H. Bollig).

### 3.6. **Wildlife**

#### 3.6.1. *Birds*

A large variety of bird species either reside at, or seasonally migrate through, the Gavins Point project area. Wetlands in the upper reaches of the lake provide breeding habitat for wood, teal, mallard, and pintail ducks. Lewis and Clark Lake is located along the Central Flyway for the North American continent. Numerous species of birds use this migratory route and rely on the diversity of habitats available within the project area. Common flyway birds include the great blue heron, double-crested

cormorant, red-winged blackbird, American white pelican, Canada goose, and grebes. Common shorebirds include killdeer, spotted sandpiper, the endangered interior least tern, and the threatened piping plover. The ring-billed gull and Franklin's gull are also common.

The Gavins Point area provides wintering habitat for the threatened bald eagle near the open tailwaters downstream of the dam (USACE 2004c). Fish are readily available in this area, providing an ample food supply for the bald eagle. Peregrine falcons have been sighted in the project area. Other birds of prey species include the red-tailed hawk, turkey vulture, osprey, and American kestrel. Ring-necked pheasants, sharp-tailed grouse, mourning doves, and wild turkeys are also common at the project. Four woodpecker species, five swallow species, blue jay, eastern phoebe, American crow, gray catbird, American robin, European starling, northern cardinal, common grackle, northern oriole, American goldfinch, various thrush and sparrow species, and several warbler species inhabit or use the area as a migration corridor during spring and fall migrations.

Bird species found at Lewis and Clark Lake are species associated with wetlands, eastern woodlands, the woodland/meadow ecotone (boundary zone), and open grasslands. Wetland habitats such as shorelines, marshes, and mudflats attract gulls, herons, rails, bitterns, sandpipers, terns, bank swallows, redwing blackbirds, wood ducks, teal, kingfishers, and many others. The woody draws and remnant forest stands around Lewis and Clark Lake provide valuable habitat to species such as sparrows, robins, brown thrashers, chickadees, grackles, nuthatches, flycatchers, grosbeaks, warblers, woodpeckers, flickers, buntings, and meadowlarks. Native prairies along Lewis and Clark Lake are home to several ground nesting species of birds. The more common birds in this group are bobolink, western meadowlark, upland sandpiper, lark bunting, long-billed curlew, McCown's longspur, burrowing owl, and several native sparrows. Upland game birds include wild turkey, sharp-tailed grouse, prairie chicken, ring-necked pheasant, gray partridge, and mourning dove.

### 3.6.2. *Mammals*

The mammals found in the Lewis and Clark Lake region include big and small game species, various furbearers, and numerous rodents. White-tailed deer and mule deer are the only big game species commonly found in the project area. White-tailed deer may be found throughout the length of the impoundment on both sides of the lake. Mule deer are less abundant and are only found in rough and broken terrain along the lake and uplands.

Small fur-bearing animals found in the project area include fox, coyote, raccoon, mink, badger, weasel, muskrat, opossum, striped and spotted skunk, beaver, rabbit, and bobcat. Their populations follow typical small mammal fluctuations, but only the bobcat is considered scarce. The fox squirrel, thirteen-lined ground squirrel, Richardson's ground squirrel, plains pocket gopher, and common species of field mice, moles, and rats are also present in the project area.

### 3.6.3. *Reptiles and Amphibians*

Nonpoisonous snake species present within the project area include the bull snake, plains garter snake, red-sided garter snake, common water snake, king snake, yellow-bellied racer, and blue racer. The prairie

rattlesnake is the only poisonous reptile found in the Gavins Point project area and is rarely observed. Other common reptiles found in the project area are the common snapping turtle, midland painted turtle, and western spring soft-shelled turtle. Amphibians inhabiting the marsh areas include bullfrogs, leopard frogs, Great Plains toads, and tiger salamanders.

### 3.7. Threatened and Endangered Species

#### 3.7.1 Federally Listed Species

The USFWS did not respond to an April 29, 2004 letter requesting agency comments on the draft Gavins Point Dam/Lewis and Clark Lake Master Plan update and draft Environmental Assessment (Appendix C of the Master Plan). However, according to USFWS web sites for Nebraska and South Dakota, appropriate habitat for ten federally endangered and threatened species exists in Bon Homme and Yankton Counties, South Dakota, and Cedar and Knox Counties, Nebraska (USFWS 2003a, 2004; Table 1).

**Table 1. Listed species in the Lewis and Clark region.**

| Species Common Name            | Scientific Name                     | Counties                          | ESA Listing |
|--------------------------------|-------------------------------------|-----------------------------------|-------------|
| Bald eagle                     | <i>Haliaeetus leucocephalus</i>     | Bon Homme, Yankton<br>Cedar, Knox | Threatened  |
| Black-footed ferret            | <i>Mustela nigripes</i>             | Knox                              | Endangered  |
| Eskimo curlew                  | <i>Numenius borealis</i>            | Yankton                           | Endangered  |
| Interior least tern            | <i>Sterna antillarum athalassos</i> | Bon Homme, Yankton<br>Cedar Knox  | Endangered  |
| Pallid Sturgeon                | <i>Scaphirhynchus albus</i>         | Bon Homme, Yankton<br>Cedar, Knox | Endangered  |
| Piping plover                  | <i>Charadrius melodus</i>           | Bon Homme, Yankton<br>Cedar, Knox | Threatened  |
| Scaleshell mussel              | <i>Leptodea leptodon</i>            | Yankton                           | Endangered  |
| Topeka shiner                  | <i>Notropis topeka</i>              | Yankton                           | Endangered  |
| Western prairie fringed orchid | <i>Platanthera praeclara</i>        | Yankton                           | Threatened  |
| Whooping Crane                 | <i>Grus americana</i>               | Knox                              | Endangered  |

**Bald Eagle.** Bald eagles are found throughout the continental United States and Canada (USFWS 2000a). In the Midwest, breeding primarily occurs in Minnesota, Wisconsin, and Michigan. Bald eagles

prefer to nest in trees near water, but may also nest on cliffs or the ground. Preferred trees are near shorelines, well separated from disturbed areas, and sturdy enough to support a nest that averages 5 feet wide and 3 feet deep. Eagle diets are typically comprised almost exclusively of fish, but eagles may also feed opportunistically on waterfowl, carrion, or small prairie mammals.

Wintering populations of bald eagles are known to be supported by three major areas of mature cottonwood timber remaining on the Missouri River in South Dakota, including portions of the Missouri National Recreational River, particularly in the Yankton/James River Island area (USFWS 2000a). Bald eagle wintering habitat on the Missouri National Recreational River below the Gavins Point Dam also has also been identified (USACE 2004c). In the Main Stem Missouri River region, bottomland cottonwood habitats provide habitat for bald eagles but have been reduced in the project area by reservoir inundation or agricultural and community development (USFWS 2000a). Eagles use the remaining available cottonwood forest habitats that are also near available forage, in particular near tailraces of dams where fish are readily available.

Black-footed ferret. Black-footed ferrets were once found throughout the Great Plains from Texas to southern Saskatchewan, Canada. Their range extended from the Rocky Mountains east through the Dakotas and south through Nebraska, Kansas, Oklahoma, Texas, New Mexico, and Arizona. Black-footed ferrets eat prairie dogs and live in prairie dog burrows in grasslands.

The main causes of the decline in the ferret population have included habitat conversion for farming, efforts to eliminate prairie dogs, and sylvatic plague, a disease that affected both black-footed ferret and prairie dog populations.

Interior Least Tern. The interior least tern is a migratory bird that historically bred along the Mississippi, Missouri, Arkansas, Red, Rio Grande, and Ohio River systems. Their historic range extended from eastern Colorado to southern Indiana and from Texas to Montana. Interior least terns still breed in most of its historical breeding range, but populations are fragmented and generally found in less-altered river segments (USFWS 1990). Precise locations of wintering areas of the interior least tern remain unknown.

Least terns arrive at breeding areas from late April to early June and spend four to five months at the breeding sites (USFWS 2000). The birds nest as lone pairs or in colonies that can exceed more than 100 pairs. The nests are constructed of small stones, twigs, and debris in shallow depressions in an open sandy area, gravel patch, or other exposed substrate. Both sexes participate in incubation of two to three eggs, usually lasting 20 to 25 days. Chicks hatch within one day of each other and fledge after 20 days. Least terns begin foraging for themselves at five weeks of age, but do not learn to fish until after migrating from breeding grounds in the fall. Life spans have been reported to range from 5 to 15 years (USFWS 2000). River hydrology and sandbar geophysics are significant elements of least tern habitat. Least terns select nesting sites on open areas of sand or gravel beaches within a river channel or reservoir shoreline

(USFWS 2000). Nests are usually located in areas that are well drained, devoid of vegetation, and at a distance from the water line. Foraging habitats include side channels, sloughs, tributaries, and shallow-water habitats adjacent to islands and the main channel (USFWS 2000). Least terns typically feed on small fish in shallow areas less than 400 yards from the nest site (USFWS 1990).

Least terns are known to be present on the Gavins Point Project area (USFWS 2000). Nesting colonies have been confirmed on sandbars in the Missouri River near the upper end of Lewis and Clark Lake (USFWS 2002b). Between 1988 and 2000, numbers of adults averaged 53 annually and have ranged from 16 in 1995 to 120 in 1998 (USFWS 2000). Nesting typically occurs on sandbars in the delta, downstream of the mouth of the Niobrara River and upstream of the Santee Reservation banks. The population is low in most years, but a significant increase in numbers occurred following a high water year in 1997. Colony sites are usually located in open expanses of sand or pebble beach within the river channel or along the shoreline (USFWS 2000). Least terns prefer to nest in areas with sparse or no vegetative cover (Schulenberg and Placek 1984). Foraging habitats include side channels, sloughs, tributaries, and shallow-water areas adjacent to sand islands (Dugger 1997). Terns are opportunistic and piscivorous, taking a wide variety of species and sizes of fish from the shallow waters of rivers, streams, and lakes (USFWS 1990).

Piping Plover. Piping plovers historically bred in three areas of North America, including (1) Atlantic coastal beaches from Newfoundland to South Carolina, (2) beaches of the Great Lakes, and (3) the northern Great Plains/Prairie region from Alberta to Ontario and south to Nebraska (USFWS 1988). Winter habitat areas are not well known although piping plovers have been observed along the Gulf of Mexico, on southern Atlantic coastal beaches from North Carolina to Florida, in eastern Mexico and on scattered Caribbean Islands (Haig and Oring 1985). Piping plover habitat remains distributed across much of the species' historic range, although in a much reduced and fragmented condition. The piping plover is a migratory shorebird found in north-central North America. Piping plovers nest on the barren sand and gravel beaches of the Great Lakes and on alkali wetlands, gravel shorelines, and river sandbars in the Great Plains. Feeding plovers utilize open, wet, sandy areas, feeding primarily on exposed substrates by pecking for invertebrates at or just below the surface (Cairns 1977).

The Missouri River in Nebraska is inhabited by approximately 300 (number shared with South Dakota) adult plovers annually (USFWS 2000). Nesting has been documented on the Missouri River main stem from Valley County, Montana to Dixon County, Nebraska with more than 25 percent of the nesting occurring between Gavins Point Dam and Ponca, Nebraska. The Missouri River provides important nesting habitat during drought conditions when ephemeral wetland nesting habitats dry up. In the Missouri River main stem

reservoirs, plovers nest along shorelines of reservoirs when the habitats are available. Nesting colonies have been confirmed on sandbars in the Missouri River near the upper end of Lewis and Clark Lake (USFWS 2002c). The USFWS has designated critical habitat for the northern Great Plains breeding population on the Missouri River and Lewis and Clark Lake.

Pallid Sturgeon. Pallid sturgeon are found in the Missouri River and in the Mississippi River downstream of the Missouri River confluence (Gilbraith *et al.* 1988). Pallid sturgeon spawn in late April or early May in the lower Missouri River and middle Mississippi River and in late May and early June in the upper Missouri River. Spawning is suspected to occur in swift water in the main channel when water temperatures are 56 to 66°F (Keenlyne and Jenkins 1993). Adhesive eggs are released into the water column in deep channels over firm substrate. Males reach sexual maturity at approximately 22 inches in length and females mature at age 7 to age 20 depending on environmental conditions (USFWS 2000). Fecundities greater than 100,000 eggs have been observed but are variable depending on fish size and environmental conditions. Pallid sturgeon are long-lived, reaching ages over 50 years.

Pallid sturgeon are adapted to big river environments with dynamic flows, high velocities, and high turbidity. Adults are frequently found in deep pools or slow velocity areas with sandy substrate in or adjoining floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channels (USFWS 2000). Pallid sturgeon are typically bottom dwellers in rivers with swift, turbid, and free flowing waters. Fish are the preferred food of pallid sturgeons, although aquatic insect larvae are also consumed in earlier life stages.

Pallid sturgeon populations or individuals are found in only a few selected areas within the Missouri River. Within the project area, only one to five sightings per year have been made of these sturgeon between the headwaters of Lewis and Clark Lake to the riverine reach above Gavins Point Dam (USFWS 2000). Numerous catches have been reported at the mouth of the Niobrara River. The Pallid Sturgeon Recovery Plan (USFWS 1993) identified six recovery-priority management areas that still provide suitable habitat. Recovery-Priority Area 3 is the portion of the Missouri River that is located 20 miles upstream of the Niobrara River and Lewis and Clark Lake.

Western Prairie Fringed Orchid. The Western prairie fringed orchid ranges from Manitoba, Canada, south to Oklahoma, east to Iowa, and west to central Nebraska. This flowering plant is usually similar in height to surrounding prairie grasses, with smooth, yellow-green foliage. Mature plants can grow up to 42 inches in height, but typically reach 20 to 30 inches in height. Non-flowering plants may consist of



only a single basal leaf and can be very difficult to find. It inhabits tallgrass calcareous silt loam or sub-irrigated sand prairies (Fritz 1993). In the northeastern Nebraska region, it is found in wet-mesic prairies and sedge meadows in alluvial soils of river floodplains that are of high to moderate quality and unplowed.

No populations are known to occur within the project area. However, any tracts of typical prairie habitat for the plant should be considered as potential habitat.

### **3.7.1. State Listed Species**

In addition to the federally listed species tracked by the Nebraska Natural Heritage Program, a number of state listed species are also monitored. Records of occurrence indicate that the state threatened lake sturgeon (*Acipenser fulvescens*) may also be present in the project area.

Lake Sturgeon. The distribution of the lake sturgeon ranges from the mainstem Missouri River and the Mississippi River to the Great Lakes region of the United States and Canada (Zuerlein 1993). The lake sturgeon is similar in appearance to the pallid sturgeon, but can grow larger, reaching lengths over seven feet, and can weigh over 300 pounds. Lake sturgeon inhabit both lakes and rivers. Spawning generally occurs from late April to late June during high water with water temperatures between 53 to 64 F. Lake sturgeon are bottom-dwelling and occur in large rivers and shallow areas of large lakes where small benthic prey items are abundant. In rivers, lake sturgeon occupy similar habitats as the pallid sturgeon, as they are usually found in deep run and pool habitats. The lake sturgeon is extremely rare in Nebraska and is especially susceptible to extinction.

### **3.8. Cultural Resources**

The region's cultural resources have been described as one of the four major culturally significant regions north of Mexico. The archeology of area consists of layers of occupation dating back to the post-Wisconsin glaciation period, 11,000 years Before Present (B.P.). Every significant time period is represented, starting at 12,000 B.P. during the Paleo-Indian Tradition and continuing through the historic period of Euro American settlement to the present.

The lands and waters within the project area include approximately 80 historic and prehistoric sites located on

Corps land. Many of these sites have not been evaluated for their significance to the National Register of Historic Places (NRHP). Sites may contain one or more artifacts. In some cases, a number of the sites contain two or more different periods of use.

### **3.9. Recreation**

A wide assortment of resources, facilities, and programs provide diverse and quality outdoor-recreation opportunities for residents and tourists. Water-based recreation activities are popular with visitors to Lewis and Clark Lake. In addition, the remaining visitors participate in land-based recreation activities that are enhanced by the proximity of the lake. Recreation activities on the reservoir include fishing, water skiing, windsurfing, canoeing, kayaking, motor boating, swimming, jet skiing, and landing of seaplanes. Additional recreation activities on lands surrounding the reservoir include camping, hunting, biking, photography, picnicking, bird watching, sightseeing, powwows, and more. In 2000, more than 7 million visitor hours were logged at Lewis and Clark Lake. Annual visitor hours are expected to increase in the coming years.

### **3.10. Visual Aesthetics**

The project lies within the Great Plains province of South Dakota and Nebraska, which is characterized by rolling hills, high buttes, and rough canyons. Vegetation adjacent to Lewis and Clark Lake is typically mixed-grass prairie on the western side and tallgrass prairie on the eastern side. Riparian and bottomland areas support deciduous woodlands with trees such as green ash, box elder, cottonwood, and bur oak. The abundance of prairie habitat, only rarely interrupted by treed riparian zones, contributes to an overall appearance of an open and sprawling landscape.

Gavins Point Dam and the numerous human-made structures in its immediate vicinity dominate the physical setting in this location. The powerhouse, administrative buildings, power lines, parking lots, roads, and intensively developed recreational areas are a significant portion of the landscape. Upstream from the dam, the lake becomes less developed and is surrounded by grassy hills and bluffs. There are 15 recreation areas surrounding Lewis and Clark Lake, ranging from smaller primitive sites to fully developed recreation areas and campgrounds.

Viewpoints at Lewis and Clark Lake are generally accessible by road. Visitors use the overlooks to gaze at the water, dam, recreational areas, landscape vegetation communities, and wildlife populations. The viewpoints also offer good vantage points for observing migrating raptors during portions of the year and provide opportunities for photography.

### **3.11. Environmentally Sensitive Areas**

A single environmentally sensitive area has been designated within the project area and is 88.8 acres in size. This area has been designated for protection and preservation of scientific, ecological, cultural, or aesthetic resources, in addition to meeting other project resource objectives. Development of public use on lands under this classification is limited or prohibited to ensure that sensitive areas are not adversely impacted. The area is managed by the Nebraska Game and Parks Commission under a park and recreation lease. No specific management practices have been identified for this area.

### **3.12. Hazardous and Toxic Wastes**

There are no permitted hazardous waste disposal facilities along the Missouri River within the project area. Some hazardous waste generators are located in cities and towns near the river and, typically, these are businesses that generate hazardous waste as a result of on-site work. These businesses treat waste on-site or ship it off-site for disposal. Some hazardous and toxic waste concerns may occur at the powerhouse, dam, or maintenance facilities. Entities within the cities of Yankton, Niobrara, and Verdel have recorded occurrences of toxic or air releases. Several hazardous waste handlers are present within these cities and there are many water discharge permits for existing entities (EPA 2004). There are no active superfund sites in the area (EPA 2004).

## **4.0. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION**

### **4.1. Geology and Soils**

Soils found within the Lewis and Clark Lake project area vary in their suitability or limitations for particular uses. Under the updated plan, proposed development will more closely consider soil characteristics and conditions during the design phase. The updated plan states that potential problems posed by soils for a particular kind or level of development must be identified during the early stages of planning for that development. In this way recreation areas, roads, structures, and other features can be properly selected and vegetative plantings can contain appropriate species and use special planting techniques if needed. Furthermore, erosion control is a specific resource objective for many of the managed lands of Lewis and Clark Lake under the updated Master Plan.

The no action plan does not address soil issues and does not provide resource management objectives for protecting soils or preventing erosion. Neither Master Plan is expected to have adverse effects on the geology or soils of the project area.

#### **4.2. Water and Water Quality**

Under the updated plan, pollutants may be introduced into Lewis and Clark Lake with construction of recreation areas. However, site plans would be prepared prior to construction, which would have detailed measures for protecting water quality. Proposed developments would not be expected to significantly increase pollutants. Although the updated plan does designate areas where potable water should be supplied, it does not include any guidelines concerning wastewater treatment issues.

Under the current Master Plan, the Corps has a general responsibility to protect water quality and water users. However, the immediate responsibility as it pertains to water supply and wastewater treatment is delegated to other parties in some cases. For instance, it is the responsibility of the State to assure that domestic water supplies and wastewater treatment systems comply with applicable standards. The Corps retains immediate responsibility for the water supply at several recreation areas and for facilities at and near the dam. In addition, the Corps is responsible for wastewater treatment at the dam.

Development of recreation areas is expected to move forward under either the 1988 or the updated Master Plan, including construction of roads, campsites, docks, and marinas. Neither plan is expected to have significant adverse effects on water quality.

#### **4.3. Vegetation**

Under the updated Master Plan construction activities could reduce vegetative cover in some areas. However, the updated plan also proposes vegetation plantings for some management areas. Trees and shrubs that may be planted would increase winter cover, woody vegetation, food sources for wildlife, and the amount of dense nesting cover for upland game. Vegetation buffers would separate cultural and natural resource areas from recreation and public use areas. Buffers along the lake shoreline would assist in preventing erosion and provide additional wildlife habitat. Creation of wetland areas would further increase the diversity and cover of native vegetation. Also, removal of non-native species in selected locations would increase native vegetation cover and should facilitate increased productivity of native

wildlife species. Neither plan is expected to have significant adverse effects on vegetation in the project area. The updated Master Plan should improve vegetation conditions around Lewis and Clark Lake.

#### **4.4. Aquatic Resources**

Development activities proposed within the Master Plan update would not occur in areas identified as wetlands. Under the updated Master Plan, existing wetlands would be protected as environmentally sensitive areas, and additional wetlands may be created at appropriate locations. Furthermore, under the updated plan, many locations have been proposed for shoreline erosion control. Placement of vegetation, logs, hay bales, cattails, and/or other erosion control mediums would prevent further degradation of the lakeshore. Prevention of erosion maintains the quality of shoreline wetlands and lake water quality. The 1988 plan does not specify management objectives for aquatic resources of Lewis and Clark Lake. No significant effects are expected to impact aquatic resources under either Master Plan. The updated plan should improve wetland and shoreline aquatic resources.

#### **4.5. Fish**

The 1988 Master Plan does not address fisheries management for Lewis and Clark Lake. Under the updated plan, there are developments proposed for construction along shoreline and open water areas, such as construction of docks, marina facilities, and fuel service stations. Neither alternative is expected to adversely effect fish of Lewis and Clark Lake. The updated Master Plan would improve fish habitat conditions through improved shoreline vegetation and wetland creation.

#### **4.6. Wildlife**

Increased visitation is expected as the human population increases. Under the updated plan, visitation may also be increased through the developments proposed to improve access and recreation sites, which could increase conflict between human and wildlife uses. However, the updated plan has several proposed measures that would benefit wildlife populations. First, development of recreational areas will be concentrated into selected sites, which would reduce visitor access into wildlife habitat areas. Second, this plan identifies 88 acres of environmentally sensitive land, which would be afforded additional protection as potential habitat for threatened or endangered species in the project area. Third, vegetation plantings are proposed, which would be beneficial to wildlife populations as cover, nesting sites, roosting sites, and as a food source. Finally, food plots are proposed to be established at many locations to

supplement food sources for game species. Under the existing plan there are no specific resource objectives for wildlife management. No significant adverse impacts are expected to affect wildlife of Lewis and Clark Lake project areas. The updated Master Plan is expected to improve conditions for wildlife populations.

#### **4.7. Threatened and Endangered Species**

Many of the proposed developments under the updated Master Plan are, as described in the wildlife and vegetation sections, intended to improve habitat for wildlife. Vegetation plantings, designation of lands under environmental and wildlife management classifications, wetland creation, and focused concentration of human use into recreational areas would all contribute to improving wildlife habitat conditions.

In general, under the updated Master Plan the development of any site would require a detailed site plan prior to construction. Evaluation of the area proposed for development would require determination of existing threatened or endangered species. In the event that an area was found to be occupied by a protected species, measures would be taken to adhere to regulatory guidelines regarding the protection of these species according to federal law.

Bald Eagle. Under the updated plan, areas utilized by bald eagles for nesting within the project area are classified as environmentally sensitive and should have improved protection over the existing Master Plan. Furthermore, these birds do not typically occupy areas that have even a small level of disturbance within close proximity and are unlikely to be found in areas designated for recreation in cottonwoods around Lake Yankton. They roost in downstream recreation areas at Gavins Point; any development activities would be scheduled so as not to disturb them. The existing plan does not specify environmentally sensitive lands or offer resource management objectives to improve wildlife habitat. Neither alternative is expected to have adverse effects on bald eagles in the project area. The updated plan should slightly improve management of habitats utilized by bald eagles.

Least Tern. The most important nesting sites are on sandbars in the Lewis and Clark Lake delta and downstream of the mouth of the Niobrara River and upstream of the Santee Reservation banks. The existing plan does not specify resource management objectives for protecting or improving wildlife habitat. Neither plan is expected to adversely impact least terns because no development or management activities are proposed for nesting areas and the updated plan should improve protection and condition of least tern habitats.

Piping Plover. The lands considered the most important for use by foraging or nesting piping plovers are classified in the updated Master Plan as wildlife management or environmentally sensitive lands. Management objectives are designed to limit impacts to these areas and improve wildlife habitat. The existing plan does not specify resource management objectives for protecting or improving wildlife habitat. Neither plan is expected to have adverse effects on piping plovers because no development or management activities are proposed for nesting areas and the updated plan should improve protection and condition of piping plover habitats.

Pallid Sturgeon. Pallid sturgeon in Lewis and Clark Lake are extremely rare. The updated Master Plan does not propose changes in fisheries management and therefore neither plan would be expected to have a significant impact on pallid sturgeon in Lewis and Clark Lake. New or additional developments that affect lake habitats, such as construction of docks, marina facilities, and fuel service stations, are limited to selected management areas and are not expected to have a significant impact on the sturgeon. No adverse effects are expected for pallid sturgeon under either plan.

Western Prairie Fringed Orchid. The western prairie fringed orchid is not known to exist on the Gavins Point project area. If an activity under either plan is scheduled in an area of potential habitat, surveys for the plant should be conducted during the flowering period in mid-June to mid-July to determine the possible occurrence of this plant. No adverse effects are expected for the western prairie fringed orchid under either plan.

#### **4.8. Cultural Resources**

The updated Master Plan will make general provisions for protection of existing and potential cultural resources. The updated plan will make provisions to protect cultural resource sites from current and future land uses. The updated plan will also require any proposed earthwork locations to be reviewed prior to initiation to determine if a cultural resource survey is necessary. Other steps taken to prevent damage to these sites will include modification of agricultural and grazing leases to remove activity from fields containing cultural resource sites and potentially significant cultural resource sites, prevention of additional recreation development on cultural resource sites within existing recreation areas unless appropriate mitigation measures are implemented, stabilization of cultural resource sites being destroyed by shoreline erosion, monitoring during any earth moving or vegetation removing activities, and monitoring of vandalism and erosion using volunteers to assist field personnel. Under the no action plan, management of the Lewis and Clark Lake area would not benefit from an accepted and overall protection of cultural resources by the managing

entities. Neither plan is expected to have a significant adverse effect on cultural resources. The updated Master plan will provide additional protection of cultural resources through the specific provisions discussed above and through integration of the Lewis and Clark Lake Cultural Resources Management Plan with the updated Master Plan and Operational Management Plan.

#### **4.9. Recreation**

Approval of the updated plan would result in greater benefits to recreation. Primarily the updated plan would provide prior conceptual approval for proposed developments, which would allow proper planning to ensure recreational development occurs where it is most appropriate, where it would minimize effects on natural resources, and where it would encourage and expedite the development process.

Under the existing plan, development of recreation in the project area may still benefit from the planning that has occurred up to date. However, recreation development is more likely to be driven by finances, authorities, and political pressures and would reflect local rather than regional demand and national interest. Each development would require specific Master Plan revision and approval. Also, the 1988 land classifications would continue to make planning and management difficult and confusing, while the project staff would continue to manage without a comprehensive and appropriately updated guiding document.

No significant adverse effects are expected to impact recreation at Lewis and Clark Lake under either Master Plan. The updated plan would provide greater benefits to recreation.

#### **4.10. Visual Aesthetics**

The updated Master Plan will concentrate the construction of facilities within designated recreation areas, preventing impacts to visual aesthetics elsewhere. The current list of visually appealing areas within the Lewis and Clark Lake project area will not be altered with the updated Master plan. The No Action alternative may result in increased visual impacts to the project area through development unchecked by special land allocations, such as environmentally sensitive areas. Neither plan is expected to have significant adverse effects on visual aesthetics. The updated plan will have greater benefits since development will be more closely guided.

#### **4.11. Environmentally Sensitive Areas**



The updated Master Plan includes the new environmentally sensitive areas land classification and designates one 88.8-acre area for inclusion. This is done specifically to identify land areas with special significance. The updated Master Plan would identify potential recreational conflicts with protected species habitat, specify the need for protective measures, and overall would benefit those areas identified as environmentally sensitive. Although environmentally sensitive lands would have to be considered during future development in the project area, they are afforded no specific or holistic protection by the existing plan. Neither plan is expected to have significant adverse effects on resources in areas the updated plan classifies as environmentally sensitive. Adoption of the updated Master Plan may provide slight improvements to resources in environmentally sensitive areas over the no action plan.

#### **4.12. Hazardous and Toxic Wastes**

The adoption of the updated Master Plan will not significantly change patterns of introduction or management of hazardous or toxic wastes into the project area. In the near future, the Corps will conduct environmental compliance surveys that may identify hazardous or toxic wastes within the project area. If areas with waste concerns are discovered, the Corps will propose remedial actions.

### **5.0. potential Cumulative effects on all species**

Cumulative effects, as defined by the Council on Environmental Quality (CEQ) for NEPA, are those impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of the agency of persons undertaking these actions.

Numerous cumulative effects from previous actions have occurred throughout the Lewis and Clark Lake area. Construction of Gavins Point Dam; filling of the Lewis and Clark Lake reservoir; deposition of sediment at the upstream end of the lake to form a delta; construction of the additional upstream dams on the Missouri River; management of the Missouri River for flood control, navigation, and water supply and hydropower; water diversions and uses of various private and public entities; development of the Missouri River floodplain for agricultural and residential uses; reclamation of floodplain lands for agriculture; and alteration of the Missouri River channel have caused dramatic changes to the entire Missouri River system. These anthropogenic changes have caused cumulative effects to resources, ecosystems, and human communities. Without a complete restoration of the Missouri River basin to its original ecological condition,

these cumulative effects will not be reversed. The Missouri River system is now primarily a passive, controlled system with dramatically reduced natural communities and habitats.

However, implementation of the updated Master Plan will incrementally reduce the cumulative effects that have occurred and are designed to also compensate for the increased visitor use and recreational use of the project area, through greater environmental protections of existing habitats, restoration of native plant communities, more stringent development guidelines, and greater maintenance of sustainable resources.

The updated Master Plan will make provisions for reducing the adverse effects on the environment that may have occurred as a result of the previous Master Plan for several reasons: 1) the new plan is founded on current environmental laws which means all future actions will be in compliance with all modern environmental laws and will also protect all species listed under the Endangered Species Act in the project area; 2) it is based on updated ecological principles, and a greater base of knowledge of the workings of a system such as the Missouri and therefore provides more effective guidelines for managing and protecting resources, and 3) the plan provides several land allocation categories, which specify appropriate management techniques for each area. For example, all areas will be managed for wildlife to the extent possible and recreational areas are divided into low use and high use depending on the environmental needs of the sites. In addition, people will be concentrated into areas of high use which should reduce the overall impact of use on the entire area to select, highly managed areas. Criteria such as spacing, buffer zones, vegetative screening, and other considerations are used in the design of recreation facilities. Vegetation plantings, designation of lands under environmental and wildlife management classifications, wetland creation, and focused concentration of human use into recreational areas will all contribute to improving natural ecological communities that will more successfully support wildlife populations.

Overall, the Master Plan update allows for the provision of more environmentally sound guidelines for the management and operation of Gavins Point Dam and the Lewis and Clark Lake reservoir. It should also provide greater awareness of potential cumulative effects and may, as a result of some management and land allocation revisions, incrementally or slightly reduce cumulative effects. Within the updated Master Plan, objectives for resource management have been identified and are realistically attainable goals for the use, development, and management of natural and manmade resources. Guidelines for obtaining maximum public benefits while minimizing adverse impacts and protecting and enhancing environmental quality have been included in the updated plan. Management objectives have been developed with full consideration of authorized project purposes, applicable Federal laws and directives, resource capabilities, regional needs,

plans and goals of regional and local governmental units, and expressed public desires.

## **6.0. public, agency, and tribal coordination**

On April 13, 2004 the Corps' Omaha District Public Affairs office distributed a news release to eight regional newspapers soliciting public comments on the draft Gavins Point Master Plan update and draft Environmental Assessment (Appendix A). Draft copies of the Master Plan update and Environmental Assessment were made available to the public on the Internet and copies were available at the Gavins Point Project Office, Sioux City Public Library, Yankton Community Library, and Siouxland Library in Sioux Falls. No comments were received during the public comment period, which ran from April 13-May 14, 2004.

On April 23, 2004 letters were faxed and mailed to congressional representatives notifying them of the distribution of the draft Gavins Point Master Plan and draft Environmental Assessment to the appropriate agencies and tribes (Appendix B). No responses were received from congressional representatives.

On April 29, 2004 the draft Gavins Point Master Plan and draft Environmental Assessment were mailed to the U.S. Fish and Wildlife Service; National Park Service; Environmental Protection Agency; Bureau of Indian Affairs; Natural Resources Conservation Service; South Dakota Department of Game, Fish, and Parks; Nebraska Game and Parks Commission; and Nebraska and South Dakota State Historic Preservation Officers (Appendix B). During the 30-day comment period, which ran from April 29-May 28, 2004, the only response was from the South Dakota office of the Natural Resources Conservation Service, which commented that the draft Master Plan was well written.

On April 30, 2004 the draft Gavins Point Master Plan and draft Environmental Assessment were mailed to the Santee, Omaha, Winnebago, Ponca, Yankton, Crow Creek, Flandreau, Rosebud, and Lower Brule tribes (Appendix B). In addition, a meeting was held with the tribes on April 22, 2004. No comments were received during the meeting or the 45-day comment period, which ran from April 30-June 16, 2004.

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## **APPENDIX A**

### **News Release**





# **APPENDIX B**

## **Correspondence**

## **FINDING OF NO SIGNIFICANT IMPACT**

### **MISSOURI RIVER, SOUTH DAKOTA AND NEBRASKA**

### **GAVINS POINT DAM/LEWIS AND CLARK LAKE MASTER PLAN UPDATE**

### **BON HOMME AND YANKTON COUNTIES, SOUTH DAKOTA**

### **CEDAR AND KNOX COUNTIES, NEBRASKA**

**August 2004**

In accordance with the National Environmental Policy Act and implementing regulations, a programmatic Environmental Assessment (EA), incorporated by reference herein, has been prepared for the 2004 update of the 1988 Gavins Point Dam/Lewis and Clark Lake Master Plan. The Master Plan update and EA became necessary when Public Law (P.L.) 105-53, Water Resources Development Act of 1999, amended by P.L. 106-541, Water Resources Development Act of 2000 (Title VI) transferred ownership of certain lands to the State of South Dakota and two Indian Tribes. The updated Master Plan will provide guidance for stewardship of natural resources and management for long-term public access to, and use of, the natural resources of Lewis and Clark Lake. The Master Plan provides a comprehensive description of the project, a discussion of factors influencing resource management and development, an identification and discussion of special problems, a synopsis of public involvement and input to the planning process, and descriptions of past, present, and proposed development. The Master Plan update only concerns areas still under the ownership of the Corps of Engineers and will only reflect changes in land allocation and jurisdiction that occurred as a result of Title VI. It does not address or relate to any other Corps management policies that govern the Lewis and Clark Lake levels or flows from the dam.

Under the No Action alternative, the 1988 Master Plan would not be updated. The No Action alternative was eliminated from further consideration because the 1988 Master Plan is out of date due to significant changes in project use conditions, pertinent laws and policies, visitor use and public demand, among other factors. If the 1988 Master Plan was not updated, future major developments or resource management policies would require approval on a case-by-case basis without the benefit of evaluation in the context of an overall plan.

The EA and comments received from other agencies have been used to determine whether the proposed action requires the preparation of an environmental impact statement (EIS). All environmental, social, and economic factors that are relevant to the proposal were considered in this assessment. These include, but are not necessarily limited to, prime farmland, water quality, air quality, noise, wetlands,

wildlife, threatened and endangered species, and cultural resources. The primary benefit of the proposed project would be the update of the 1988 Master Plan to reflect important changes in project-use conditions and land transfers as a result of the Title VI Land Transfer. No adverse impacts to threatened or endangered species or cultural resources are expected to occur as a result of projects proposed under the updated Master Plan. The proposed actions would be in compliance with applicable environmental statutes.

It is my finding, based on the environmental assessment, that the proposed Federal activity will have no significant adverse impacts on the environment, and the proposed project will not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an EIS will not be prepared.

18 September 2004

Date

(SIGNED)

Jeffrey A. Bedey

Colonel, Corps of Engineers

District Engineer

